# MODELING PLACE ATTACHMENT IN TWO NEIGHBORHOODS OF COLUMBUS, OHIO

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BY

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# ABSTRACT

Researchers in social sciences have studied place attachment. Although, some researchers view place attachment as multidimensional, others view it as one dimensional. The simplest multidimensional models include two dimensions of *place dependence* and *place identity*. However, other studies have added other dimensions to this construct.

Research has focused more on personal, social and demographic dimensions than on the physical attributes of the environment. Furthermore, studies which include physical attributes tend to examine the perceived features, possibly overlooking the impact of physical environment. Studies also overlook spatial patterns, particularly in urban settings.

This dissertation has three objectives. It assesses the factoral construct of place attachment. It builds conceptual place attachment models which center on physical and social attributes. It studies the spatial distribution of place attachment and its underlying factors in the sample area.

This dissertation gathers data through mail survey, Google map Street-View, and GIS spatial analysis. The surveys asks residents to rate their place attachment levels towards their respective neighborhood, their social attributes, and then to draw their neighborhood boundaries and special places on the paper maps. I collected 143 valid

survey responses from two neighborhoods, Italian Village and University Area, in Columbus, Ohio. I used Google Street-View observations to assess the conditions of fixed physical attributes on the block edges facing the streets (excluding back alleys). I also used ArcGIS, as a complementary means, to measure various physical attributes.

Confirmatory factor analysis reveals a four-factoral structure of place attachment. The analysis used structural equation models to create the conceptual models of place attachment, and it finds statistically significant direct and indirect effects of physical and social attributes on place attachment. Finally, using spatial autocorrelation analysis, this study finds spatial clustering in place attachment and its underlying factors. Overall, the findings support the role of physical environment on place attachment. Findings can help planners and urban designers in creating desirable places for residents and visitors. Planners can use findings on place attachment to develop design guidelines and evoke higher level of attachment to guide future designs at place or area scale.

Dedication

To My Parents

Acknowledgments

My advisor, Jack Nasar, has been patiently guiding me from the first year through finishing this dissertation. I can safely say he taught me everything I know about academic research. Besides being his student in multiple classes, I have had the honor of working for him at the Journal of Planning Literature. Dr. Nasar has everything one can ask for in a boss.

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# CHAPTER 1

# INTRODUCTION

The present dissertation centers on place attachment in relation to physical, social and perceived attributes. Many branches of social sciences (human geography, policy, resource management and social psychology) refer to place attachment offering varying definitions. However, most scholars agree that it is a bonding between individuals and their important places (Altman & Low, 1992; Giuliani, 2003), and that it is a *positive* bonding (Giuliani & Feldman 1993; Williams & Patterson, 1999). Affective reaction is a key way in which a person relates to the environment (Russell & Snodgrass, 1987; Wicker, 1984). Place attachment research probably originated in the 1960's with studies on displaced people and emotional distresses that follows. Proliferation of concepts and terms and measurements for each concept has confused this area of research. Scholars have used terms such as *topophilia, rootedness, place identity, sense of place, sense of community and urban identity* (Hernandez, Hidalgo, & Ruiz, 2013).

Tuan (1974) coined the concept *topophilia* as an affective bond between people and places. However, others suggest that place attachment includes behavioral and cognitive aspects that go beyond a mere affective response (Francescato, Weidemann, & Anderson, 1989). It is a bond with an enduring quality, directed toward a specific target. It can develop directly through long-term experiences with places, or indirectly through

learning about places (Kudryavtsev, Stedman, & Kransy, 2012). Attachment has individual and collective sides. Some studies use a similar place construct called sense of place (Buttimer & Seamon 1980; Relph, 1997; Tuan, 1980). Sense of place involves an interpretive perspective on the environment and the emotional reaction to it (Altman & Low, 1992). It combines affective, cognitive and connotative attitudes toward a spatial setting (Jorgensen & Stedman, 2001). Sense of place involves an experiential process created by the interaction between place and people (Steele, 1981). Although some researchers use place attachment interchangeably with sense of place, others see place attachment as a subpart of sense of place (Jorgensen & Stedman, 2001).

Sense of community is another related concept. It is the sense of belonging and identification, and commitment to one another. Sense of community has four main components: membership (feeling of belonging), influence (sense of mattering to a group), reinforcement (integration and fulfillment of needs), and finally the shared emotional connection (McMillan & Chavis, 1986).

Although *space* may be a relatively undifferentiated territory (Altman & Low, 1992) when people assign meaning to space, it becomes a *place*. A place can thus transfer from being a sheer resource for goal realization to an essential part of one's self (Williams, Patterson, & Roggenbuck, 1992). Tuan (1974) defined place as center of meaning constructed by experience, and said that space becomes place as we become familiarized with it. A place is a location in the environment with a layout and a surface. It can be located by its inclusion within a larger place (Gibson, 1979).

Time is central to cultural and individual attachment to landscapes. The actual age of landscape and the meaning assigned to it over time contribute to attachment. Ahlbrandt (1984) found that age and length of residence were positively associated with neighborhood attachment. Interaction with other people also affects place attachment (Eisenhauer, Krannich, & Blahna 2000). Altman and Low (1992) see place attachment as a concept that involves: attachment (affect, cognition and practice), places (varying in scale), actors (individuals, actors or cultures), social relations (individuals, group, and cultures) and temporal aspects (linear or cyclical). They postulate place attachment as a symbolic relationship formed by people giving shared affective meaning to a particular space that provides basis for understanding of the relationship to the environment. In their seminal study, Scannell and Gifford (2010) proposed a three dimensional model of place attachment: *place, person* and *psychological process*. Among all the variables affecting place attachment, place is the most important. The *person* dimension includes individual and groups. Although the individual level involves personal connection to places, the group level involves meanings shared among members. At this level, place attachment becomes a cultural or even religious experience. The *psychological process* has three parts: affects or emotional connections to place; cognition or the memories and believes that individuals hold toward the place; and behavior or actions relating to attachment.

Why study place attachment? Place attachment keeps the residents in the neighborhood and enhances the quality of life. It may affect resident mobility, especially for moves that are not self-initiated. Residents with higher levels of place attachment are less willing to move than those with low levels (Brown & Perkins, 1992). Furthermore, a

user-oriented resident is more likely to move than an attachment-oriented resident (Brown, Reed, Harris, & 2002). Place dependence, as a component of sense of place, also plays a role in moving decisions. People make judgments about their prospective new environments as they assess how new places will meet their range and types of needs (Kleit & Manzo, 2010).

Place attachment also has implications for pro-environment behavior (Biedenweg, 2007; Devine-Wright 2013; Heimlich & Ardoin, 2008; Kudryavtsev, Stedman, & Krasny, 2012). In discussing climate change, researchers vary on the scale of place attachment relevant to this phenomenon. Devine-Wright (2013) argues that the issue of climate change represents a situated phenomenon that is contextualized in places and emotions towards them, but Jasanoff (2010) suggests, climate change represents a global issue that connects to personal meaning and changing behaviors towards a more environmentally-friendly ones is a universal goal. Studies assumed that changing beliefs, attitudes, and cognitions must precede behavior change (Oskamp, 1987; Weigel & Blurton, 1983).

Others emphasized the implications of place attachment in resource management and development of recreation and tourism policy (Amsden, Stedman, & Kruger, 2011). Place attachment has policy implications, especially when the responsibility for resource use is shifted to local levels. Place attachment/sense of place play an important role in post disaster recovery (Chamlee-Wright & Storr, 2009; Mishra, Mazumdar, & Suar, 2010; Shklovski, Burke, Kiesler, & Kraut, 2010). Sense of place played an important role in the early resident return to New Orleans. Positive expectation reduced the perceived risk of returning (Chamlee-Wright & Storr, 2009).

Place attachment has been studied at various scales. Home, block, neighborhood, city, and country. Present study focused on the neighborhood scale. However, neighborhood boundaries are amorphous. Some residents recognize the block as their neighborhood, others go beyond it and include places they shop or work in their neighborhood boundary (Sastrey, Pebley, Michela, 2002). Thus, place attachment research must identify the community boundaries. Geographic boundaries are important in another aspect. The geographic proximity to a locale may influence the meanings associated with places (Brandenburg & Carroll 1995).

Despite the many studies on place attachment, the field lacks theory (Lewicka, 2011). Most studies have an exploratory nature and a few have tried to test specific theory-driven hypotheses. One can see the lack of theory in a branch of studies that contemplate the dimensions of place attachment and sense of place (Goudy, 1990; Hidalgo & Hernandez, 2001; Jorgensen & Stedman, 2001; Kaltenborn & Bjerke, 2002; Raymond, Brown, & Weber, 2010; Riger & Lavrakas, 1981). Although some researchers view place attachment/sense of place as multidimensional, others view it as one dimensional. The simplest multidimensional models include two dimensions of social bonding and physical bonding. In environmental psychology, research often defines place attachment as consisting *place dependence* and *place identity* (Brown, 1987). However, other studies have other dimensions to this construct such as *place satisfaction* (Kaltenborn & Bjerke, 2002) *social bonding* (Raymond et al 2010; Kyle, Graefe & Manning, 2005).

Research on place attachment/sense of place has focused more on social and demographic attributes than on physical attributes. These attributes include length of residence, homeownership, age, and number of children in the household. Studies consistently show that length of residence predicts place attachment (Flaherty & Brown, 2010; Hill, 1996; Sampson, 1998; Smaldone, 2008; Sundblad & Sapp, 2011). Research on the physical attributes has focused on two arenas: non-urban and urban areas. In the non-urban areas, studies have focused on the effects of landscape attributes, such as wilderness, recreational areas, areas with high amenities or distance to natural landscape on place attachment and sense of place (Arnberger & Eder, 2012; Brown & Harris, 2002; Brown & Raymond, 2007; Clark & Stein, 2003; Jorgensen, 2010; Jones, Paterson, & Hammitt, 2000; Jorgensen & Stedman, 2011; Kyle et al, 2005; Matarrita-Cascante, 2010; Spartz & Shaw, 2011; Stedman, 2003; Trentelman, 2011). In the urban areas, studies have found effects of public green areas, presence and quality of foot paths, presence of shopping areas in walking distance, architectural quality; presence of porches and mix of uses on place attachment/sense of place (Jorgensen & Stedman, 2006; Kim & Kaplan, 2004; Lund, 2002; Plas & Lewis, 1996; Wood, Frank, & Giles-Corti, 2010). However, studies usually use human ratings of the attributes rather than direct physical measures. Furthermore, some researchers argue that individuals do not become attached to places directly as the result of physical attributes, but rather to the perceptions of that those attributes (Stedman, 2003).

Perceived attributes may have an effect on place attachment, but they do not offer clear guidelines for urban design, since perceptions may differ across people and

populations. Physical attributes may not have effects on place attachment unless they are processed through perceptions. However, the urban design guidelines used in practice are based on physical rather than perceived attributes. Thus, the studies using physical attributes are more relevant to urban design practice. These studies may help planners and urban designers in creating desirable places for residents and visitors. For example, increasing the area and frequency of public green spaces in neighborhoods can enhance place attachment among the residents. Planners can also use findings on place attachment to develop design guidelines and social policy for public spaces (Rishbeth, 2013). Furthermore, they can use information on the places that evoke higher level of attachment to guide future designs at place or area scale.

This dissertation has three main objectives. It assesses the factoral construct of place attachment. It builds conceptual place attachment models, general place attachment model and a model for each of the underlying factors, which center on physical and social attributes of the studied sample. It studies the spatial distribution of place attachment and its underlying factors in the sample area. For these models it asks: 1) if physical attributes affect place attachment factors directly or through social attributes, 2) if the social attributes affect place attachment factors.

These objectives and the questions that followed led me to the following research questions:

1) Is place attachment a multi-factoral or single factor construct?

2) Are place attachment factors predicted directly by only physical attributes?

3) Are place attachment factors predicted directly by only social attributes?

4) Does place attachment (the single item stating "I am attached to my neighborhood") reveal spatial clustering?

5) Do the underlying factor of place attachment show spatial clustering?

# CHAPTER 2

# LITERATURE REVIEW

## Theories

### *Attachment Theory*

The present review discusses attachment theory first and then place attachment theories. For place attachment, the review then discusses the place attachment construct, factors that affect it (social and physical/perceived), research on it for natural environments and built environments, and finally, complementary research on environmental preferences.

The formation of meaningful connections with the surrounding is central to human experience (Scannel & Robert, 2014). Human surroundings include individuals, groups, objects, and places. Attachment theory centers on person-to-person bonds. It grew out of observations of infants and mothers (Bowlby, 1969, 1974, 1980). Bowlby (1974) described attachment as infant behaviors that elicit adult proximity and care-giving responses. Furthermore, he saw proximity to an attachment figure, mostly mother, who provides the infant with safety and comfort, as central to the theory (Bowlby, 1962, 1974; Ainsworth, 1967). Bowlby (1974) claimed that instinctive behaviors have their roots in neurophysiological structures of the body and attachment bonds to someone gives feelings of security and well-being in the presence of the person.

Attachment theories that include identity describe how the psychological structure of the self emerges from the intersubjective context of attachment relationship, providing a biological developmental basis for social identity theories. Attachment theories mainly consider the social environment and attribute no significance to the child's relationship with the physical environment (Morgan, 2010).

Attachment theorists differ on the degree to which it relates to nature versus nurture. Some argue that the emotional bonds among humans represent a basic component of human nature. Relationships among humans have a key survival function in the form of protection (Bowlby, 1988). Giuliani (2003) postulates that attachment behavior has biological roots and is characteristic of species. 'This behavior is mediated by an organized control system rooted in neurophysiological processes which incorporates information on the environment and allows behavior to be planned as a function of its purpose' (Giuliani, 2003). On the other hand, the degree of social interactions affects the creation of affective bonds forming the attachment (Bowlby, 1980). These arguments could mean that although attachment to the original attachment figure is an intrinsic phenomena, future bonding is nurtured through social interactions. Attachment phenomenon is present at birth, but its organization changes over the lifespan (Bowlby, 1969). As the child grows, attachment bonds become more concrete and while the need for autonomy arises in adolescence, he/she will continue to use parents as a secure base (Scannell & Gifford, 2010).

So far, the review pointed out the two approaches to attachment theory: the instinctive and biological roots versus the nurturing role of social interaction. Overall,

people find comfort and peace in presence of others and in social bonding. But the presence of others does not solely produce comfort and peace. Rather, places can have this quality. Behavioral scientists postulate the presence of strong person-place bonds. This leads us to the theories on place attachment.

### *Place Attachment Theories*

As with attachment theory, emotion represents a crucial part of the relationship between people and their environment. However, the measurement difficulties have led many place attachment theories to ignore this emotional connection, focusing on behavior and cognition (Morgan, 2010). However, attachment theory claims that all actions and thoughts are motivated by feelings (Basch, 1988). Studies of person-place relationships started with territoriality and place identity and soon turned to place attachment (Scannell & Gifford, 2010).

Place attachment has ties to personal attachment. It develops through proximity, safety, and secure base and separation distress (Scannell & Gifford, 2010). Morgan (2010) adds exploration and emotional arousal as another component when explaining the origins of place attachment in children. He viewed the physical environment as a medium influencing child's behavior. Children's exposure to the physical environment causes arousal to their motivational system, leading them to move away from the attachment figure (mother) to explore the physical setting. When this interaction elicits pain or anxiety, the child comes back to the attachment figure seeking comfort. This cycle of emotional arousal, interaction and positive affect repeats itself. Experience of

pleasure as a result of childhood interactions with physical settings is also central to the developmental model of place attachment (Morgan, 2010).

Place attachment develops alongside personal attachment. The two concepts are part of a mutually reinforcing process. They develop through a repeated process of arousal, interaction and pleasure. Based on the familiarity and scale, place itself can represent a kind of attachment figure. The scales could vary from homes and city blocks to neighborhoods, cities country and the entire planet (Morgan, 2010). Historical or spiritual significance and/or the physical pleasantness and design qualities can enhance the role of place (Scannel & Gifford, 2010). Continuity of person-place relationship also enhances place attachment; sense of continuity results primarily through length of residing in a place and the associated experiences (Lewicka, 2013).

Some studies argue that patterns of attachment is the product of childhood experiences (Altman & Low, 1992). Place attachment literature mentions an inside-outside dialectic. Insideness and outsides refer to the degree of comfort and discomfort experienced in place (Scannel & Gifford, 2010). Existential insideness is the most profound experience in place where the experience is immersed unselfconsciously in place (Relph, 1976). Lim and Barton (2010) tested children's sense of place via the concept of insideness. They argued that the development of sense of place among children is not a passive, but a dynamic process that encompasses experiences and interactions that increase their feelings of competence and self-confidence. Children obtain knowledge about the environment to overcome the obstacles and challenges in the environment. We have seen that some view place attachment from an inside-outside

perspective which is based on the degree of comfort of experience in the place (Morgan, 2010). Others see place attachment as a phase of sense of place. Those place it as a phase between place belonging and place commitment (Shamai, 1991).

Attachment and place attachment have two main differences: the absence of an attachment figure in place attachment, and the absence of place in personal attachment. Although, Giuliani (2003) argues that the differences outweigh the similarities, research suggests that people see enough parallels between the two concepts. However, the parallels between the two concepts are significant enough, that some studies argued for a subjective sense of being shaped by place (Morgan, 2010). Attachment to mother (as the attachment figure) exists at birth, yet the social and physical environment develops and expands it. This applies to place attachment. The next session discusses the factoral constructs in place attachment and sense of place as a close concept.

## Place Attachment Construct

Studies of place meaning used the concept of sense of place. Although, some researchers use sense of place interchangeably with place attachment, others view place attachment as a part of sense of place (Jorgensen & Stedman, 2001). Some researchers view place attachment/sense of place as one-dimensional. However, most researchers view it as multidimensional. Jorgensen and Stedman (2001) argued that a one dimensional model that included residents' thoughts, behaviors and feelings explained more of the variance than any other model. Another study concluded a one-dimensional model that included *satisfaction, identity,* and *dependence* on the place, emerged as one

item (Kaltenborn & Bjerke, 2002). Most studies reveal a multidimensional construct of place attachment and sense of place. Several studies find that place attachment encompasses *rootedness* (physical bonding) and *social attachment* (Goody, 1990; Hidalgo & Hernandez, 2001; Riger & Lavrakas, 1981). Others have identified two similar dimensions: *place dependence* and *place identity* (Halpenny, 2010; Hwang et al, 2005; White et al, 2007; Williams & Vaske, 2003). Using confirmatory factor analysis for ratings obtained on four recreation sites in Colorado, Williams and Vaske (2003) found that subjects distinguished between two dimensions of place attachment: place dependence and place identity.

Place dependence, or the functional attachment, refers to the perception of aspects of environments that meet occupants' needs. It highlights the role of physical environments on place attachment. Certain amenities and resources provided by the built and natural settings supports one's goals (Scannell & Gifford, 2010). For this reason, some researchers refer to place dependence as functional attachment (Williams & Vaske, 2002). Place identity contains memories, ideas, feelings and meanings of physical settings which relate to the everyday existence of occupants (Brown, 1987). It refers to cognition of physical settings in which an individual maintains his sense of self (Korpela, 1989). Some scholars go further and define it as emotional attachment (Williams & Vaske, 2003).

One study suggested a different construct in which place identity develops after place attachment (Hernandez et al., 2013). It argued that a person could be attached to but not identified with a place. Comparing natives to non-natives, Hernandez, et al. (2013)

measured place identity and place attachment at different place scales. Factoral structures revealed that attachment and identity behaved differently among natives and non-natives. Natives showed similar levels of the two concepts at most scales. However, non-natives showed higher levels of attachment. This meant that place identity needed more time to develop.

Another component of place attachment might be *place satisfaction* (Brown & Werner, 1985; Churchman, 1997; Stinner, Van Loon, Chung, & Byun, 1990). Place satisfaction is the perceived quality of the physical setting in meeting one's needs (Stedman, 2002). One study of place attachment considered *place satisfaction* along with *place identity*, and *place dependence* (Kaltenborn & Bjerke, 2002). However, the high internal consistency between the three kinds of attachment items, led the researchers to a one factor model in which the three kinds of measures combined as one. Stedman (2002) identifies a sense of place model comprised of place attachment and place satisfaction. In his view, place satisfaction derives from cognition, but place attachment derives from identity. Another study found positive effects of place attachment on place satisfaction (Ramkissoon, Smith, & Weiler, 2013). They defined place attachment as a four-factor construct comprised of place identity, place dependence, place affect (sense of psychological well-being for the visitors), and social bonding. However, they defined place satisfaction as single item that comprised satisfaction with various dimensions of the environment. They concluded that future research may contemplate place satisfaction as a multi-dimensional concept that addresses physical, functional and social dimensions.

In sum, studies have identified up to three distinctive factors in place attachment: place identity, place dependence, and place satisfaction. However, I believe that social bonding could act as the fourth factor. It is based on interpersonal relationships and distinguishes itself from the other three factors. The next section introduces factors that affect place attachment/sense of place. These factors range from the social attributes to physical and perceived attributes of the environment.

## Factors That Affect Place Attachment

### *Social Factors*

This section discusses four social attributes: *length of residence, homeownership, community activity*, and *close ties to neighbors*. First consider length of residence. Many studies find length of residence as a significant predictor of sense of place, sense of community and place attachment (Arnberger & Eder, 2012; Brown & Raymond 2007; Clark & Stein, 2003; Comstock, et al., 2010; Sampson, 1988; Stedman et al, 2010; Trentelman, 2011). Willingness to continue being in place can explain place attachment (Lewicka, 2013). Jorgensen and Stedman (2006) concluded that the *number of days spent on the property* affects sense of community. Stedman (2006) also found that year round residents show higher levels of sense of community than seasonal residents. Other studies found that year-round residents identify themselves mostly with social networks, but part-time residents identify themselves with physical characteristics (Soini, Vaarala, & Pouta, 2012; Stedman, 2006). Hay (1998) found that a true sense of place is only developed in those who lived in the place for a long time. Incorporating a one-dimensional construct of

community attachment, a study showed that length of residence predicted community attachment (Arnberger & Eder, 2012). Comstock et al (2010) used place attachment as a single component construct in their hierarchical model. Length of residency emerged as associated at a statistically significant level with neighborhood attachment levels controlling for all other social variables (including home ownership). Measuring place attachment with a single item, another study found that more than twice as many respondents who lived in the area for 20 years or more reported positive place attachment than those who lived in the area for 10 years or less (Trentelman, 2011). Using a multilevel test, Sampson (1988) studied the relationship between length of residence, local friendship ties, social activity and place attachment. He found that length of residence had direct effects on local ties, social activity and the one-item measure of place attachment.

Why is length of residence the most significant predictor of attachment? Perhaps time translates into familiarity and familiarity translates into preference and attachment. Studies have confirmed the association between familiarity and preference or positive affect (Imamoglu, 2000; Kaplan, 1987; Nasar, 1980; Pedersen, 1978; Purcell, 1992; Van den Berg, Vlek, & Coeterier, 1998; Zajonc, 1968). The mere repeated exposure to a stimulus enhances an individual's positive affect toward it (Zajonc, 1968). Herzog et al (1976) studied the effects of familiarity on environmental preferences using three experimental conditions: slides, labels and imagery. Familiarity and complexity taken together explained 48% of variations in preferences. Showing photos of different part of the city to two groups of students, a study showed that people look more favorably at

places closer to them (Nasar, 1980). Memory is another product of length of residence acting as a glue that connects people to places. Among these, childhood memories of place have the most effect (Lewicka, 2013). Proust (1934) emphasizes the memorability of landscape as the setting for personal/social experience. He saw attachment as a phenomenon that arises from experience. He also argued for the entanglement of experience and remembrance of landscape. Thus the essential factor in attachment is not the landscape itself, rather the memory and experience of that landscape. He believes that the imagined landscape has more meaning and importance in human experience than the landscape experienced concretely.

Now consider homeownership. Studies also find it to influence sense of place/place attachment (Eisenhauer et al, 2000; Lund, 2002; Mesch & Manor, 1998; Wood, Frank, & Giles-Corti, 2010). Mesch & Manor (1998) used the idea of limited liability to explain how social and economic investments (e.g. home ownership and having young children) facilitate social relationships and place attachment eventually. They found that homeownership affects place attachment indirectly and through the number of locally based relationships. Comstock et al (2010) also found positive relationship between homeownership and place attachment. Lewicka (2011) argues that the time and financial investment involved in buying and decorating one's house leads to higher emotional connections.

Research has also found place attachment related to social interactions and community activities (Fornara, Bonaiuto, & Bonnes, 2010; Soini, Vaarala, & Pouta, 2012; Stedman, 2000; Stedman, Beckley, Wallace, & Ambard, 2004). Studies have

measured these variables in various ways. A study found direct effects of *number of friends and neighbors known by residents* on neighborhood attachment (Mesch & Manor, 1998). Neighborhood attachment, as the dependent variable, was measured with three dichotomous items coded 1 and 0. Logistic regression was used to determine the dynamics of neighborhood attachment. They found that locally based relationships affect sentiment toward the community. Soini et al (2012) used 31 statements to formulate sense of place. Principal component analysis reduced them to seven components. They suggested that social relations among the more socially connected residents and physical attributes among the residents with weak social bonds construct sense of place. Lewicka (2011) argued that close relations with neighbors is a predictor of place attachment and that close relations and social ties can make the place more meaningful. On the other hand, place attachment can make the residents form more social ties. Finally, a study found that property-related activities and lake associations are related to place attachment (Stedman, 2006).

Other studies have included attributes such as *age* and *education* (Bonaiuto et al, 1999; Fried, 1984; Krannich & Greider, 1984; Lalli, 1992; Lewicka, 2005). However, these variables show different patterns of effects. Lewicka (2011) argues that everyday attachment (attachment to neighborhood) was positively associated with age and negatively associated with education. However, civic attachment (attachment to the city) was positively associated with education. I believe that education exposes people to larger network of people and places and transfers attachment from locally based to more civic based. Also spending time in the place, getting married and having *children living*

*at home* would result in higher levels of place-generated meanings and attachments (Lewicka, 2011). Having children living at home exposes people to social networks related to children's academic or athletic activities.

Following the previous research (Arnberger & Eder, 2012; Brown & Raymond 2007; Clark & Stein, 2003; Comstock, et al., 2010; Sampson, 1988; Stedman et al, 2010; Trentelman, 2011), the present dissertation used length of residence as the main social factor in place attachment models. It also included homeownership, number of group memberships, number of neighbors known by name, number of children under 18 living at home, education level, gender and age. It used a model in which a latent variable retained from homeownership and length of residence relates to place attachment indirectly and through another latent variable retained from number of group memberships and number of neighbors known by name. This follows Mesch and Manor (1998) who found that homeownership had an indirect effect on neighborhood attachment. Homeowners are more likely to have local ties which will in turn, increase their sentiment levels to their neighborhoods.

### *Effects of Physical Attributes*

Place attachment studies have overlooked the role of physical factors. When they consider physical factors, they use ratings of the perceived environment rather than direct physical measures of it. I do not intend to belittle the role of the perceived attributes. Rather, I am pointing to the need to also consider physical effects on place attachment. Perceived attributes are important in connecting people to the environment. Some

researchers argue that individuals do not become attached to places directly due to physical attributes, but rather the perceptions and meanings that those attributes represent (Stedman, 2003). Appearance and meaning are central to the city functions to the extent that their incompatibility could lead to fear, anxiety, stress and elevated crime rates (Taylor, 1989).

The physical attributes can be divided into attributes of non-urban and urban areas. People can also feel attached to a place due to its natural or built physical characteristics. Studies in natural resources, human geography and foresting have found effects of landscape attributes, such as wilderness, recreational areas, areas with high amenities or distance to natural landscape on place attachment and sense of place (Amsden et al, 2011; Arnberger & Eder, 2012; Brown & Harris, 2002; Brown & Raymond, 2007; Clark & Stein, 2003; Comstock et al, 2010; Jorgensen, 2010; Jones, Paterson & Hammitt, 2000; Jorgensen & Stedman, 2011; Kyle, Graefe & Manning, 2005; Matarrita-Cascante, 2010; Soini et al, 2012; Spartz & Shaw, 2011; Stedman, 2003; Stedman et al, 2004; Trentelman, 2011). However, physical attributes are not limited to non-urban areas and natural landscape. Attributes of urban areas such as special places, public spaces, mix of uses, architectural style, historical significance, development levels, walking conditions/safety, presence and quality of footpaths, presence of local shops, public access and other physical features have been shown to affect place attachment (Eisenhauer et al, 2000; Francis, Giles-Corti, Wood, & Knuiman, 2012; Fried, 2000; Jorgensen & Stedman, 2006; Kweon, Sullivan, & Wiley, 1998; Lund, 2002; Plas &

Lewis, 1996; Nowell, Berkowitz, Deacon, & Foster-Fishman, 2006; Shamai & Ilatov, 2004; Stedman, 2011; Talen, 2000; Wood, Frank, & Giles-Corti, 2010).

Although research on place attachment has tended to overlook the physical attributes of places, research on *environmental preferences*/*satisfaction* and *active living* has identified physical attributes. This is important to the present research because place attachment relates to preference and satisfaction. Kaltenborn and Bjerke (2002) found the level of place attachment correlated with perceived *attractiveness*; and Jones, Paterson and Hammitt (2000) found preferences and belonging correlated. They explored the relationship between preference towards landscape settings and emotional attachment to them. Factor analysis on the photos, indicated the presence of same four factors measuring belongings and preferences, and high correlation between preferences and belonging. These studies further emphasize the role of built environment in environmental preferences and place attachment. Studies have associated a few physical attributes to place attachment. The question now would be to find other similar or different physical attributes associated with preference and active living. The following section I will discuss the physical attributes associated with place attachment, active living, and preference. These effects are either direct or indirect and through perceptions and attitudes.

### *Naturalness in Non-Urban Areas*

Studies have mentioned natural landscape, recreational areas and the overall attitude toward these elements as significant predictors of place attachment and/or sense of place. Place attachment relates to the natural and recreational landscape. This ties in with a body of research showing preference for and restorative value of nature (Kaplan & Kaplan, 1989). Amsden et al (2011) used resident photography to find the importance of places to the community and meanings they conveyed. Results indicated a strong attachment to natural environment. Assessing the meanings to places, the authors found strong associations to recreation. Another study found *attitude toward native vegetation* to affect sense of community (Jorgensen & Stedman, 2006). A longitudinal study on the temporal characteristics of place attachment, a study found higher levels of attachment for natural landscapes (Korpela, Ylen, Tyrvainen, & Silvennoinen, 2009). It also found reliability in temporal stability of favorite places with more consistency in natural than urban settings. These result indicate the importance of natural landscape and how people stay in favor of them through time.

### *Naturalness in Urban Areas*

Bonaiuto, Aiello, Bonnes, and Ercolani (1999) found place attachment related to the presence of green areas. Arnberger and Eder (2012) also found an effect of green areas. This study asked on residents' feelings about their community. Stepwise regression analysis revealed positive relationship between *high-quality green space* and community attachment. Place attachment construct in the last two studies centered mostly on

affective bonds to the place and neglected the behavioral and cognitive components. Another study showed how local residents identify with and account for the natural landscape within their communities and how natural landscapes affect place attachment (Clark & Stein, 2003). Hur and Nasar (2010) found overall neighborhood satisfaction associated with physical measures of environmental attributes and indirectly through perceptions. *Naturalness* predicted the overall satisfaction indirectly and through perceptions of naturalness.

### *Order and Upkeep*

Studies have found negative relationships between graffiti and other semi-fixed and movable incivilities and place attachment and place satisfaction (Brown, 2003; Brown, Perkins, & Brown, 2004; LaGrange, Ferraro, & Supancic, 1992; Spelman, 2004). It reduces preference and physical activity (Ellaway, Macintyre, & Bonnefoy, 2005; Handy, Boarnet, Ewing, & Killingsworth, 2002). Studies have also found relationships between fixed features of incivilities such as vacant houses and dilapidated buildings and place attachment and preference (Accordino & Johnson, 2000; Brown et al, 2004; Hur, 2010). The broken window theory proposes that incivilities and physical disorder precedes crime. Failing to address the declining physical conditions in neighborhoods may spur serous heightening in crime rates (Kelling & Coles, 1996).

Research has found relationship of upkeep and order on preference/satisfaction. Besides naturalness and openness, order and upkeep manifested as significant predictors of preferences among two sets of population in the US and Japan (Nasar, 1984). Other

studies have found positive effects of order and upkeep (contextulism) on preferences (Galindo & Hidalgo, 2005; Levi, 2005; Stamps, 1994). Contextulism, an attempt to make contemporary architecture sensitive and adaptive to its surroundings, may enhance preference. Levi (2005) found aesthetic ratings related to contextual compatibility. Galindo and Hidalgo (2005) found rated attractiveness related to contextulism. Stamps (1994) found that people prefer city blocks of almost *homogeneous* characters, with buildings differing in either scale. Studies also show that historical significance increases the imageability of buildings (Evans, Smith, & Pezdek, 1982; Lynch, 1960). In a study of suburban infill blocks, a study found that infill ratio negatively affected compatibility (Nasar & Stamps, 2009). The study used block images with houses of the same style but varying sizes and ratios of the infill development. Separate groups were asked to rate compatibility and visual appeal. Infill ratio affected both compatibility and visual appeal. However, compatibility did not translate into visual appeal.

### *Mix of Uses and Presence of Local Public Spaces*

Studies found positive effect of presence of pubs, shops and coffee shops on development of emotional bonds with neighborhoods (Alexander, Ishikawa, & Silverstein, 1977). Other studies noted the prominence of public spaces such as local shopping areas and grocery stores (Francis, Giles-Corti, Wood, & Nuiman, 2012; Kweon, Sullivan, & Wiley, 1998; Talen, 2000). Lund (2002) found higher levels of sense of community in the traditional neighborhood. He studied two neighborhoods that differed in physical attributes and found that sense of community was associated with presence of

shopping areas within walking distance. In line with the findings of Lund (2002), another study found the relationship between physical attributes such as local grocery stores and walking distance to public spaces and place attachment (Plas & Lewis, 1996).

Studies examine the effect of the quality and quantity of public spaces on place attachment/sense of place/sense of community. New urbanist theory suggests two ways in which public spaces can improve the sense of community and place attachment. First, by integrating the public spaces with residential areas and making public spaces accessible to all. Second, by carefully designing high quality public spaces. (Talen, 2000). In another word, planners and designers should carefully consider the quality and quantity of public spaces. Studies showed the following attributes to affect place attachment, sense of place or sense of community: subjective distance to public spaces (Francis et al, 2012; Talen, 2000) quality (Francis et al, 2012; Kweon, Sullivan, & Wiley, 1998) size and frequency (Talen, 2000).

One study found significant effect of the subjective quality of neighborhood public spaces and shops on sense of community (Francis et al, 2012). Logistic regressions showed higher values for sense of community among residents who reported higher quality of public spaces and those who lived a subjective distance of less than five minutes from their park. Another study confirmed that close distance to public space affected place attachment (Sugihara & Evans, 2000). It used ArcGIS to determine the neighborhood boundaries, size and quantity of public spaces (Talen, 2000). The study found that small and frequent public spaces fostered resident interaction and sense of community. Churches represent third places, which may serve as a hub for gathering and

bonding (Putnam, 2001) and thus in place identity (Cuba & Hummon, 1993). Presence of churches may increase social interactions which will in turn increase place attachment and satisfaction. According to Fried (1982), community satisfaction may contain satisfaction with social relations. Proponents of neo-traditional developments argue that mix of uses causes residents to walk from place to place and come to causal contacts to one another, and therefore, leading to creation of higher sense of community (Duany & Plater-Zyberk, 1991).

### *Development Levels Openness and Density*

Fried (2000) found that *density* fosters social interactions. Jorgensen and Stedman (2006) and Stedman (2011) also found *density* predict sense of place. Nasar (1984) found that preference increased with the openness of urban scenes. Another study found overall neighborhood satisfaction associated with physical measures of environmental attributes and indirectly through perceptions. *Openness* emerged as the most important variable predicting the overall satisfaction (Hur & Nasar, 2010). Switching attention to open views, Lynch (1960) suggested that *well managed panoramas* are staples of urban enjoyment. Other studies have confirmed increase in preferences associated with openness. Blocked prospect evokes fear of crime, avoidance and reduces preference (Nasar & Fisher, 1993). Stamp (2008) found that *prospect* (the unimpeded opportunity to see) results in preferences for environments. A study found significant effects of *shared outdoor areas* and visual proximity to them on neighborhood satisfaction (Kearney, 2006). It showed that nature views decreased residents' concerns on neighborhood

density. Although, I have put the attributes openness, development levels and density under one header, one should note that these attributes may have different effects based on the setting. Although in the urban areas, density and development levels may foster social interactions and eventually enhance place attachment, in the non-urban and recreational areas, people may desire lower level of development. Openness, may or may not correlate with density. It has more to do with visual access than it has to do with the actual development levels. Lynch (1960) defined it as an unimpeded visual access.

### *Historical Significance*

Historical significant may also relate place attachment. People generally consider historical areas as more meaningful (Nowell, Berkowitz, Deacon, & Foster-Fishman, 2006). They express higher levels of attachment to residential neighborhoods with preserved historical character than the new developments deprived of it (Lewicka, 2008). A study showed significant correlation between the two types of historical significance in samples of two European countries (Lewicka, 2013). Historical significant also increases preference (Levi, 2005; Galindo & Hidalgo, 2005). Levi (2005) found that aesthetic ratings related to historical and fake historical buildings. Comparing three styles of buildings, the study found higher aesthetics for historical buildings, followed by fake historical and contemporary. Another study found that historical character affected visual interest (Galindo & Hidalgo, 2005). Respondents in the study found *cultural-historical* places attractive. Stamps (1994) found that people look more favorably at old buildings than new ones.

### *Walkability*

Studies on the effects of physical environment on walkability and physical activity have examined effects of physical attributes of environment (Day, Boarnet, Alfonzo, & Forsyth, 2006, 2011; Handy et al, 2002; Nasar, 2008). Some of the factors that might affect physical activity include: mix of uses, presence of sidewalks, and physical barriers flanking sidewalks (Handy et al, 2002). Explaining characteristics of urban design that affect preferences, a study found effects of *prominence of vehicles* (Nasar, 1984). This physical attribute alongside physical barriers flanking sidewalks effects walking safety (from cars) and play an important role on walkability. A set of studies have compared attachment between traditional/new urbanist and suburban neighborhoods. Lund (2002) found higher levels of sense of community in the traditional neighborhood. The two neighborhoods differed in physical attributes. The traditional neighborhood had short blocks, continuous and network of sidewalks and front porches and he found positive relationships between these attributes and sense of community. Comparing a prototypic new urbanist community to a suburban development, another study found that the residents of the new urbanist community had higher place attachment, community attachment and sense of identity (Kim & Kaplan, 2004). The prominent physical factors in predicting sense of community in both communities included presence/quality of footpaths and the overall walkability of the communities. The overall walkability and connectivity also emerge as influential in a study in the new urbanist community, Seaside, FL (Plas & Lewis, 1996). They used design elements such as sandy paths and porches. These design elements were associated with sense of place.

Walkability elements such as quality/presence of sidewalks, and local shops in walking distance predicted place attachment in another study (Bonaiuto et al, 1999).

### *Architectural, Urban Design Characteristics*

A study found positive relationship between perceived features of architecture/urban design and place attachment (Bonaiuto et al, 1999). The researchers identified eleven perceived architecture and urban design features. The results indicated that building aesthetics pleasantness, building volume, internal/external connections predict neighborhood attachment. Studies have reported difference of preference among architects and public (Devlin & Nasar, 1989; Fawcett, Ellingham, & Platt, 2008; Nasar, 1997: Purcell & Nasar, 1992). In a study of design review, Stamps and Nasar (1997) found that public dislikes modern and atypical styles. This agrees with other findings (Devlin & Nasar, 1989; Purcell & Nasar, 1992). Confirming the differences in preference between architects and public, a study found the importance of roof shapes in public's preference. In contrast, architects' preferences focused on architectural style and showed indifference to roof shape (Fawcett, Ellingham, & Platt, 2008). Assessing public preferences, a study identifies three types of aesthetic variables: formal, symbolic and schemas (Nasar, 1994). Nasar (1994) asserts that designs need to encourage variety, familiar elements, natural material and popular styles.

Recall, the present dissertation seeks to assess the factoral construct of place attachment, and develop conceptual models of place attachment based on social, and physical attributes. It uses several items to assess the place attachment construct. It uses:

- Place attachment, single item from Arnberger (2012);
- Place identity, three items from Jorgenson (2006) and Kyle et al. (2004);
- Place dependence, three items from Jorgenson (2006);
- Place satisfaction, three items from Adriaanse (2007) and Hidalgo and Hernandez (2001)
- Social bonding, three items from Nasar and Julian (2009), and Comstock et al, 2010).

In assessing the effects of social attributes on place attachment, this dissertation uses the following attributes from the place attachment/sense of place/sense of community research:

- Number of children below 18 living at home (Flaherty & Brown, 2010; Mesch & Manor, 1998; Sampson, 1988);
- Number of voluntarily associations (Stedman, 2006);
- Number of neighbors identified by name (Mesch & Manor, 1998);
- Status (Flaherty & Brown, 2010; Williams et al, 2010);
- Homeownership (Eisenhauer et al, 2000; Lund, 2002; Mesch & Manor, 1998; Wood et al, 2010);
- Length of residence (Flaherty & Brown, 2010; Sampson, 1998; Smaldone, 2008; Sundblad & Sapp, 2011; Trentelman, 2011);
- Gender (Flaherty & Brown, 2010; Williams et al, 2010);
- Age (Flaherty & Brown, 2010; Williams et al, 2010); and
- Education level (Williams et al, 2010).

In assessing the effects of physical attributes, this dissertation uses the following attributes from the place attachment/sense of place, preference research:

- For upkeep (Galindo & Hidalgo, 2005; Handy et al, 2002; Levi, 2005; Nasar, 1984, 1985) it assesses presence of graffiti, poles and wires, presence of dilapidated buildings, presence of real; estate signs, and dilapidated public features.
- For walkability (Day et al, 2006; Jorgensen & Stedman, 2006; Handy et al, 2002; Kim & Kaplan, 2004; Lund, 2002; Nasar, 1984, 1985; Plas & Lewis, 1996), it assesses absence of traffic, presence of sidewalks, presence of treelines flanking sidewalks, presence of lawns flanking sidewalks and on-street parking.
- For housing style (Delvin & Nasar, 1989; Nasar, 1989; Stamps, 1993), it assess multi-family housing, single-family housing, duplexes, and presence of porches.
- For mixture of uses (Duany & Plater-Zyberk, 1991; Frank et al, 2004) it follows the logarithmic index developed by Frank et al (2004).
- For openness and naturalness (Day et al, 2002; Hur & Nasar, 2002; Lynch, 1960; Nasar, 1984, 1985; Nasar & Fisher, 1993; Stamps, 1994, 2008) it assesses the number and size of parks in each neighborhood (Talen, 2000).
- For density (Fried, 2000; Jorgensen & Stedman, 2006; Stedman, 2011) it assessed the percentage of area covered by built landscape.
- For distance to public spaces (Francis et al, 2012; Kweon et al, 1998; Talen, 2000), it assesses linear distance to public special places.

This dissertation has three main objectives: 1) It assesses the factoral construct of place attachment 2) It builds conceptual place attachment models, general place attachment model and a model for each of the underlying factors, which center on physical and social attributes of the studied sample. 3) It studies the spatial distribution of place attachment and its underlying factors in the studied area.

These objectives and the questions that followed led me to the following research questions:

1) Is place attachment a multi-factoral construct comprised of *place identity, place dependence, place satisfaction* and *social bonding*?

2) Are place attachment factors only predicted by physical attributes? That is, residents would exhibit higher levels of place attachment factors in areas with less *graffiti*, more *shops and eating places, churches, treelines flanking sidewalks*, and *on-street parking.*

3) Are place attachment factors only predicted by social attributes? That is, residents with higher *tenure, social ties, age*, and *education level, number of children living at home* would show higher levels of place attachment factors.

4) Does place attachment (the single item stating "I am attached to my neighborhood") reveal spatial clustering?

5) Do the underlying factor of place attachment show spatial clustering?

# CHAPTER 3

# METHODS

## Study Design

This study used three data collection methods: a survey, Google Street-View and Geographic Information Systems (GIS). It used four data analysis methods: Analysis of variance (ANOVA), factor analysis, structural equation modeling, and spatial statistics. From December 2013 to May 2014, I mailed 1600 surveys to Columbus, OH residents in 80 blocks in Italian Village and 240 blocks in University Area. I chose these numbers to reflect the relative areas and populations of the respective neighborhoods. Fifteen percent of the Italian Village residents and ten percent of University Area residents returned the surveys (Average of 11% return rate).

The survey measured place attachment construct: *place identity, place dependence, place satisfaction,* and *social bonding*, socioeconomic characteristics of the residents, and perceived neighborhood boundaries and special places.

I used ArcGIS to analyze various attributes of each resident's perceived boundary. "ArcGIS for desktop allows to analyze data and author geographic knowledge to exam relationships, test predictions, and ultimately make better decisions." (Which ArcGIS for, 2015). These attributes included: building density, mix of uses, area of the neighborhood boundary, total area of the special places, the linear distance from the respondents home

to the closest special area, total sidewalk length, and total length of lawn flanking sidewalks. I used Google Street-View to count number of houses with porches, number of single-family houses, number of duplex houses, number of multi-family houses, number of dilapidated buildings, presence of graffiti, street material, total on-street parking, total number of shops, eating places, churches, and places with outdoor dining. I added on-site observations in areas were recent development took place[1]. (See the description of each attribute in Appendix H).

The data analysis had three main steps. First, I used confirmatory factor analysis to determine the factor structure of place attachment. Second, I used structural equation modeling to analyze the associations between and within the variables effecting place attachment. Finally, I used spatial statistics to determine the spatial distribution of place attachment and its underlying factors.

## Participants

This study focused on two neighborhoods in Columbus, Ohio. I selected the neighborhoods based on the boundaries identified by neighborhood commissions in the city of Columbus. These two neighborhoods, Italian Village and University Area, differ in their physical and socioeconomic context. I sent surveys to randomly selected residents in the two neighborhoods. One hundred and fifty two people responded to the surveys. I had to drop three responses due to the incomplete answers. Four people did not do the mapping procedure, and two did not mention the closest street intersection. From the

[1] These physical attributes were calculated as count per areas

remaining 143 responses (62 men and 81 women), 46 (23 men, 23 women) lived in Italian Village and 97 (39 men, 58 women) lived in University Area. Most participants reported a bachelor's or higher degree (83.9%), ages between 20 and 39 (65.0%), renting their unit (55.2%), and living in the neighborhood for more than ten years (20.3).

I mailed surveys rather than using online surveys, because households in lower income neighborhoods, may not have access to internet. Because mailed surveys tend to have low response rates unless the researcher sends frequent reminders (Brown, 2006; Stedman, 2002; Syme, Nancarrow, & Jorgensen, 2002; Eisenhauer, Krannich, & Blahna, 2000), I sent reminders to the households which received a survey package. In December 2013, I sent out my first batch of mails, 250 surveys, to the residents of Italian Village. I sent the next batch in 45 days, aiming at both new addresses and the residents that did not respond to the first mail. In total, 400 surveys were set to residents in Italian Village. Out of the 400 surveys, 46 responded (11.5 percent). In February 2014, I sent 750 surveys to the residents of University Area. Finally, in March, 2014, I sent the next batch of 450 surveys to both new addresses and residents that did not respond to the first mail. Out of the 1200 surveys sent to the residents of University Area, 97 responded (8.2 percent).

I obtained residents' addresses from Google Maps. I checked them using the reverse directory at www.whitepages.com, which also reported the resident's name/s, building use, and apartment number (if applicable). I only sent mails to currently occupied residential addresses. I used a cluster sampling to select residents for surveys in each of two neighborhoods in Columbus, OH: Italian Village and the University Area. I first selected blocks at random in each neighborhood. Then on each block, I selected five

houses. I started with first house at the Southeastern corner and moved to each third house on the right until I had selected five houses.

With each survey I put a cover letter which briefly introduced the research, and an IRB letter of consent. The cover letter asked for a household member over the age of eighteen to complete the survey. Residents received pre-paid envelopes to return their surveys. I displayed the distribution of responses in Figure 3.1. As one can see, there is a high density of responses in Italian Village. This is related to the survey exhaustion among some of the areas within University Area. For example, residents of Weinland Park, South of University Area, have experienced a few studies in the recent years. The overall response rate is low. This is due to multiple reasons. Paper surveys require more time to complete and send back. People might be more reserve in answering questions regarding their feelings and emotional responses. Also, lack of funding prohibited me from offering incentives and following up with the respondents more than two times.

The overall low response rate introduces a non-response bias and gives less credibility to the study (Baruch & Holtom, 2008). Although figure 1 shows relatively acceptable spread in respondents' locations, this sample of respondents cannot be a true representation of the residents of the two neighborhoods. Indeed, the residents who responded might be the ones who showcase higher levels of place attachment to start with. Thus, one should be cautious when generalizing the results based on such samples.

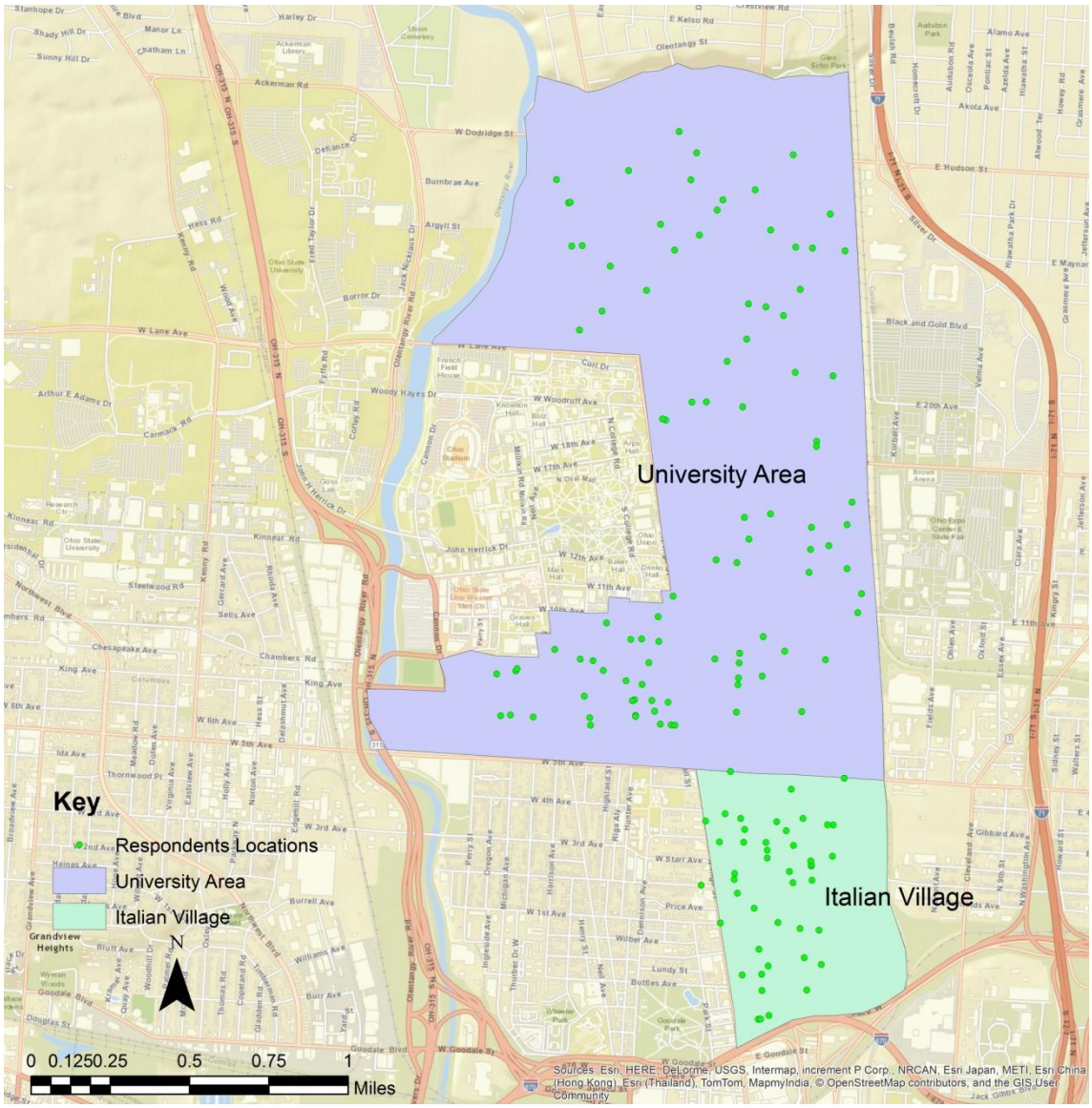



Figure 3.1 The distribution of respondents in the study area. The map shows more concentration of responses in the Italian Village and the part of University Area South of the Ohio State University.

## Study Area

I displayed the boundaries of Italian Village and the University area as defined by the city of Columbus in Figure 3.2. Comparing to Italian Village, the University Area has a higher population density and lower median age, median household income, median

rent and percent of married couples with children. Surrounding the Ohio State University, it has many students. University Area and Italian Village have similar median residence for renters. See Table 3.1 and 3.2 for socioeconomic characteristics of the participants and the two neighborhoods in general.

Table 3.1
Socioeconomic characteristics of the participants

| | Italian Village % | University Area % | Total % |
|---|---|---|---|
| Gender | | | |
| Female | 50.0 | 59.8 | 56.6 |
| Male | 50.0 | 40.2 | 43.4 |
| Married | 39.1 | 20.6 | 26.6 |
| Have children under 18 at home | 13.0 | 29.9 | 24.5 |
| Homeownership | 65.2 | 35.1 | 44.8 |
| Education level | | | |
| Less than high school | 0.0 | 1.0 | 0.7 |
| High school | 35.0 | 17.0 | 14.7 |
| Bachelor or higher | 65.0 | 82.0 | 84.6 |
| Length of residence | | | |
| Residing < 2 years | 28.3 | 35.4 | 33.1 |
| Residing 2-5 years | 28.2 | 29.2 | 28.9 |
| Residing 5-10 years | 26.1 | 13.6 | 17.6 |
| Residing > 10 years | 17.4 | 21.8 | 20.4 |
| Number of residents known by name | | | |
| < 4 neighbors | 28.3 | 53.6 | 45.4 |
| 5-9 neighbors | 43.5 | 27.8 | 32.9 |
| 10-14 neighbors | 8.7 | 10.3 | 9.8 |
| > 15 neighbors | 19.5 | 8.2 | 11.9 |
| Member of associations | 69.6 | 33.0 | 44.8 |
| Age | | | |
| <20 Years old | 0.0 | 2.1 | 1.4 |
| 20-39 Years old | 52.2 | 71.1 | 65.0 |
| 40-59 Years old | 41.3 | 19.6 | 26.6 |
| > 60 Years old | 6.5 | 7.2 | 7.0 |
| Median age | 32.2 | | |

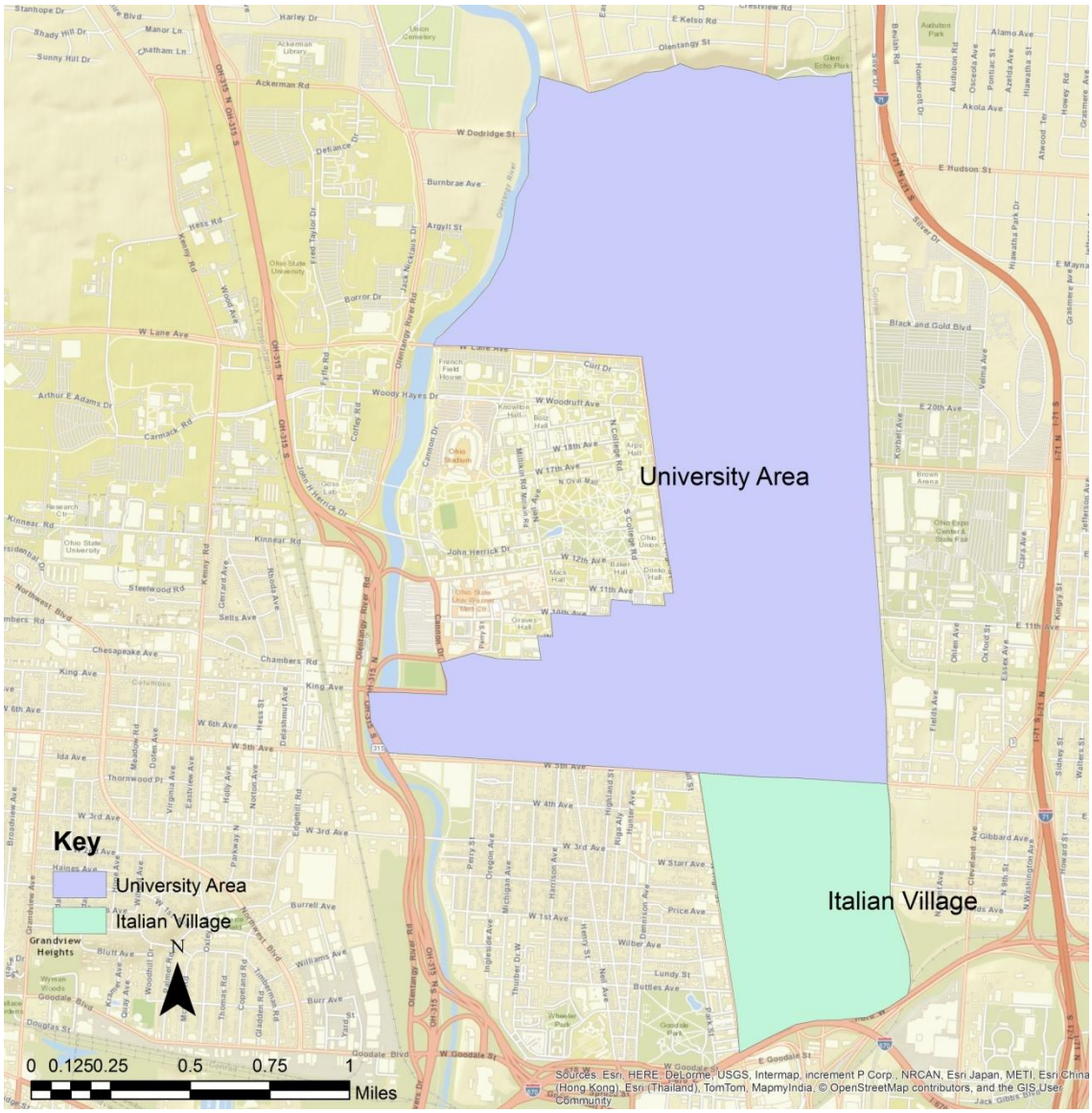



Figure 3.2 Study area comprised of University Area and Italian Village

Italian Village, in the near North side of Columbus and close to the central business district, has Fifth Avenue on its north, High Street on its West, I-670 on its South and Conrail railroad tracks on its East. One of Columbus's first suburbs, Italian Village was annexed to the city in 1862 (italianvillage.org). Though predominantly residential (80 percent) it also has industrial and commercial buildings. Residential

buildings (single family, double houses and row houses) have narrow lots and short setbacks from the street. Its architecture has roots in the 19th and the turn of 20th century with many examples of Italianate and Queen Anne, and most buildings have vernacular as opposed to high style (Italian Village Historic Guidelines, 1990).

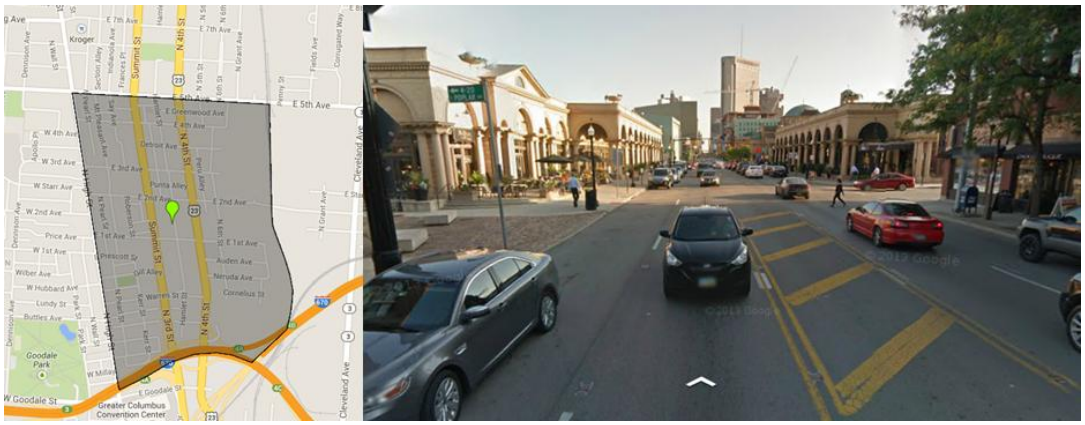



Figure3.3 On the left, Italian Village map. On the right, Short North Area with shops and restaurants on both sides of High Street, a major artery in the city separating Italian Village and Victorian Village. Many of the residents pointed to shops and restaurants in the Short North Area as their places with special qualities.

Almost two miles from downtown, the University Area has Glen Echo Ravine to its north, Conrail Corridor to its east, Fifth Avenue to its south and Olentangy River to its south. University area is city's most densely populated area and contains more than 650 businesses, human service agencies, churches, and schools. University Area businesses include boutiques, retail, the Gateway Theater, and a variety of restaurants and bars. The University Area offers diverse housing stock. There are a variety of pleasant residential neighborhoods, several historic districts as well as the off-campus core student neighborhood. The University Area was not originally part of the city of Columbus. One of the major events in the evolution of the area was the decision to develop the State

Agricultural College Grounds on the site of the Neil farm in 1870.The university grew slowly at first, but began to expand significantly from 1900 to 1925 (University Neighborhood Revitalization Plan, 1996).

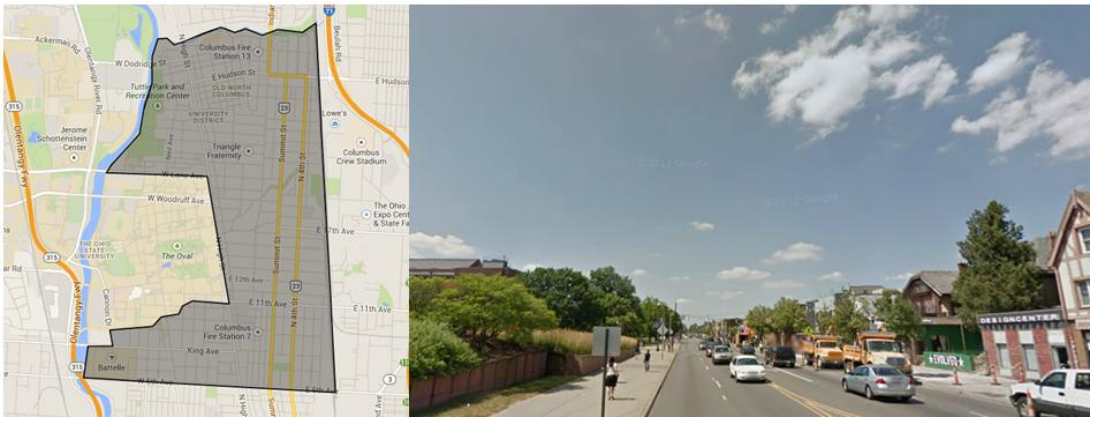



Figure 3.4 On the left, University Area. On the right, High Street running through University Area. Residents mentioned shops and restaurants on both sides of High Street as areas with special qualities

Table 3.2
Comparing various aspects of the two neighborhoods

| | Italian Village | University Area |
|---|---|---|
| Median age | 32.2 years | 23.8 years |
| Average household size | 1.9 | 2.5 |
| Percentage of people below poverty level | 4.3% | 63.1% |
| Median household income | $40,610 | Not Attained |
| Housing value | | |
| Average value of detached houses | $186,134 | $157,662 |
| Average value of attached houses | $169,586 | $139,543 |
| Median rent | $781 | $635 |
| Area | 0.464 sqmi | 2.147 sqmi |
| Population density | 6,991 people/sqmi | 16,992 people/sqmi |

## Instrument

To develop and refine the survey instrument, I used focus groups and then cognitive interviewing.

*Focus Groups*

Before designing the surveys, I attended planning commissions of each of the respective neighborhoods and briefly discussed my research. Then, I distributed pilot surveys, different from the ones later sent to the residents. I received twelve responses from University Area and eight from Italian Village Commission meeting. The respondents in University Area were comprised of six planning commissioners and six residents attending the meeting. The respondents in Italian Village were comprised of five planning commissioners and three residents attending the meeting. I asked for respondents who lived in the neighborhood for at least a year. This resulted in responses by 20 people (12 men and 8 women). In the pilot surveys, I sought to (i) identify additional built environment features that might affect place attachment (ii) delineate major paths, nodes, landmarks, roads and intersections in ach neighborhood (iii) identify prominent public spaces within each neighborhood (See an example of the questions in the appendix A). Focus groups like this can help develop physical inventories (Day et al, 2006).

I also asked the commissioners to write about their neighborhood memories and their level of attachment, and I asked them to predict the overall level of attachment of their neighbors and to give reasons for their prediction. Using the results and my knowledge of the literature, I created a first draft of the survey. Results indicated that

most respondents were highly attached to their neighborhood. The respondents in Italian Village commission predicted almost as high level of place attachment for the residents. Respondents in University Area also predicted high levels of resident place attachment. However, their prediction of resident place attachment level was lower than that of Italian Village respondents. In sum, the two groups mentioned restaurants, bars, bakeries, parks, schools, and walking trails as places they felt attached to. They often mentioned High Street as the major path in both neighborhoods, followed by Neil Avenue, Summit Street and Fourth Street. There was no real agreement over major landmarks, nodes and intersections.

### *Cognitive Interviewing*

I used the cognitive interviewing technique (Willis, Lessler, & Caspar, 1999) to evaluate the draft survey. Of the two methods used in cognitive interviewing, Think Aloud and Verbal Probing, I used Verbal Probing. After the interviewee answered a question, I further probed the answer by asking relevant questions. I asked respondents if they could repeat the question in his words. I asked them how hard it was to arrive to that answer. The first two probing questions were the same for all survey statements. However, the last question varied based on each statement. For example for the statement, "*Being a member of this neighborhood is like being member of a group of friends"* I said, "Can you repeat this question in your own words?" After they answered I said, "How did you arrive at that answer? How hard was it to answer it?" Or "I noticed that you hesitated. Tell me what you were thinking." For a specific probe, I said, "Do you

think your neighborhood should be friendly?" I used the responses to refine the survey questions.

### *Final Survey*

The survey started with the place attachment construct section. It had thirteen statements on the four components of place attachment. In addition to one question on place attachment, it had three questions for each component of place attachment: place dependence, place identity, place satisfaction and social bonding. I drew the items from other studies (Arnberger, 2012; Comstock, 2010; Fornara, 2010; Jorgensen et al, 2006; Hidalgo & Hernandez, 2001; Hur, 2008; Kyle, 2005; Kyle et al, 2004; Nasar & Julian,, 2009; Soini et al, 2012; Wynveen, Kyle, & Sutton, 2012). Each statement had a 5-point Likert scale ranging from *strongly disagree* to *strongly agree*. Note that three of the statements had a negative tone to avoid response set bias:[2] Question three on place dependence, question two on place identity, question three on place satisfaction and question three on social bonding. I've listed the items below with the category and source above them[3].

Place attachment (Arnberger, 2012)

I feel attached to my neighborhood

Place dependence (Jorgenson, 2006)

[2] Other studies of place attachment also use negative-toned statements (Jorgensen, 2006; Lewicka, 2004, 2008; Long, Perkins, 2003)

[3] I randomized the order of these statements in the residents' surveys. I also did not mention the category for each statement.

1. My neighborhood is the best area for doing the things that I enjoy most

I wouldn't substitute any other neighborhood for the type of activity I do here

There are better places to be than my neighborhood

Place identity (items 1 and 2, Jorgenson, 2006; item 3, Kyle et al, 2004)

1. I feel like I can be really myself at my neighborhood.
2. My neighborhood says very little about who I am
3. This neighborhood means a lot to me

Place satisfaction (items 1 and 2, Adriaanse, 2007; Item 3, Hidalgo & Hernandez, 2001)

1. The layout of this neighborhood is convenient
2. I am satisfied with my living environment
3. It wouldn't really be that bad if I and the people who I appreciated in the neighborhood moved out

Social bonding (Items 1 and 2, Nasar & Julian, 2009; item 3, Comstock et al, 2010)

1. Being a member of this neighborhood is like being a member of a group of friends
2. People here know they can get help from others in the neighborhood if they are in trouble
3. This is not a close-knit neighborhood

The surveys then asked the residents to report their age, gender, marital status, number of children under 18 in the household, education, homeownership, length of

residence, number of residents identified by name, membership in neighborhood groups, and the closest street intersection to resident's house (See appendix B).

Finally, the survey presented respondents with a 1:20,000 map that showed an area about twice as large as the neighborhood and asked them to:1) identify the neighborhood boundaries, and 2) identify up to five special places/areas in their neighborhood that they feel mostly attached to and give a brief reasoning behind their selection.

### *Studied Independent Variables*

Based on the closest street intersections, I mapped the location of each respondent using the geocoding services in http://www.esri.com/software/arcgis/arcgisonline/credits/geocoding. This is a user friendly interface offered by Environmental Systems Research Institute (ESRI), where one can simply upload the set of addresses and obtain the map with geocoded addresses. The website undertakes the geocoding process obtaining geographic coordinates based on respondents postal addresses.

Next, I mapped the residents' perceived neighborhood boundaries and special places. Studies show that residents often do not agree on the neighborhood boundaries among each other, and also on the neighborhood boundaries provided by the city. Sketch maps are distorted, incomplete, and schematized (Huynh & Doherty, 2007; Tversky, 2003b, 2005; Waterman & Gordon, 1984). I mapped these geographic boundaries using the street network TIGER file obtained from the US census website. See Figure 3.5 for an

example of resident mapping of neighborhood boundary and three special areas within the neighborhood.

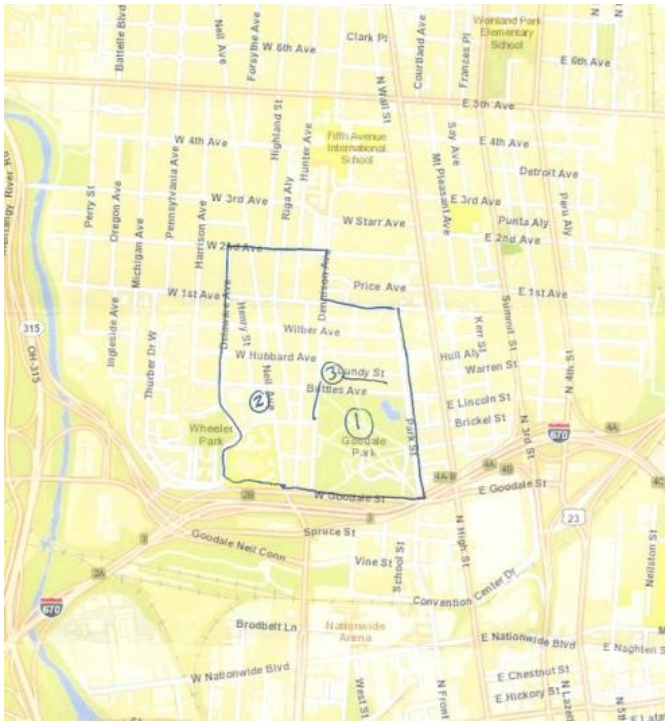



Figure 3.5 Example of resident mapping on the paper base-map showing an area twice as big as the resident's neighborhood, identified by the city

Recall that this study had three main objectives. It sought to: 1) test various constructs of place attachment, uni/multidimensional and reach a final factoral model; 2) construct (using structural equation models) a place attachment model based on the physical, and social variables; and 3) assess the autocorrelation in place attachment item and the four underlying factors in place attachment construct.

I have listed physical and social attributes in Tables 3.3 and 3.4 (In Table 3.3, I have organized physical attributes under a set of categories). Furthermore, I have

illustrated some of the physical attributes in Figures 3.6 to 3.8. (See Appendix H for the full description of each attribute and their various levels).

Table 3.3
List of the selected physical attributes for the study

| Category | Physical Attribute | DESCRIPTION |
|---|---|---|
| Upkeep | | |
| | DILAPB | Percent of dilapidated buildings |
| | GRAFFITI | Rate of graffiti seen from the street |
| | DILAPPUB | Rate of dilapidated public features |
| | POLES | Total sum of poles and overhead wires per area |
| | SIGNS | Total sum of real estate signs per neighborhood area |
| Walkability | | |
| | TREELN | Total length of treeline flanking the sidewalks per neighborhood area |
| | SUMLAWN | Total length of lawns flanking sidewalks per neighborhood area |
| | STREETMAT | Total length of brick streets in neighborhood |
| | ONSTPARK | Total length of cars parked on street per neighborhood area |
| | SUMSDWALK | Total length of sidewalks per neighborhood area |
| Housing style | | |
| | MULTI | Percent of multi-family housing |
| | SINGLE | Percent of single-family housing |
| | DUPLEX | Percent of duplexes |
| | PORCH | Percent of houses with porches |
| Mix of uses | | |
| | RES | Percentage of residential area |
| | COM | Percentage of commercial area |
| Destinations | | |
| | SHOP | Total number of shopping places per neighborhood area |
| | EAT | Total number of eating places per neighborhood area |
| | OUTDIN | Total number of places with out-door dining per neighborhood area |
| | CHURCH | Total number of churches per neighborhood area |
| Parks | PARKAREA | percentage of neighborhood covered by parks |
| | PARKNUMB | number of parks in the neighborhood |

Continued

Table 3.3 Continued

| | | |
|---|---|---|
| Special places | | |
| | TOTALSPECIAL | Total area of special places marked by each resident |
| Category | Physical Attribute | DESCRIPTION |
| | CLOSDIST | The closest linear distance from resident's home to the special area marked by the resident |
| | SPECIALBD | Total area of special places marked by each resident per neighborhood area |
| | CLOSDISTBD | The closest linear distance from resident's home to the special area marked by the resident per neighborhood area |
| | DISTPARKBD | The closest linear distance from resident's home to a park in the neighborhood per neighborhood area |

Table 3.4
List of social attributes for the study

| Social Attributes | DESCRIPTION |
|---|---|
| N.CHILD | Number of children under 18 living at home |
| N.GROUPS | Number of voluntarily associations one participates at his/her neighborhood |
| N.NEIGHB | Number of neighbors one can identify by name |
| STATUS | Married or single |
| HOMEOWNERSHIP | Ownership status |
| LENGTH OF RESIDENCE | Length of residence at the current address |
| GENDER | Gender |
| AGE | Age |
| EDUCATION | Education level |

Figure 3.6 Dilapidated building University Area (Top Left), graffiti University Area (Top Right), on-street parking University Area (Bottom Left), real state sign Italian Village (Bottom Right)

Figure 3.7 Brick-street Italian Village (Top Left), sidewalk University Area (Top Right), multi-family housing (Bottom Left), treelines Italian Village (Bottom Right)

Figure 3.8 Porches Italian Village (Top Left), outdoor dining Italian Village, Weinland Park University Area (Bottom)

## Procedure

### *Physical Inventory*

This study used blocks as the unit of observation, and used only the edges facing the streets, excluding back alleys. Passersby more likely experience the street than the back alleys. In analyzing the physical attributes, each perceived neighborhood map was broken down to the underlying blocks. The underlying blocks were ones where their centroids laid within the target boundary. I have illustrated an example of chosen blocks in a resident's drawn boundary in Figure 3.9.

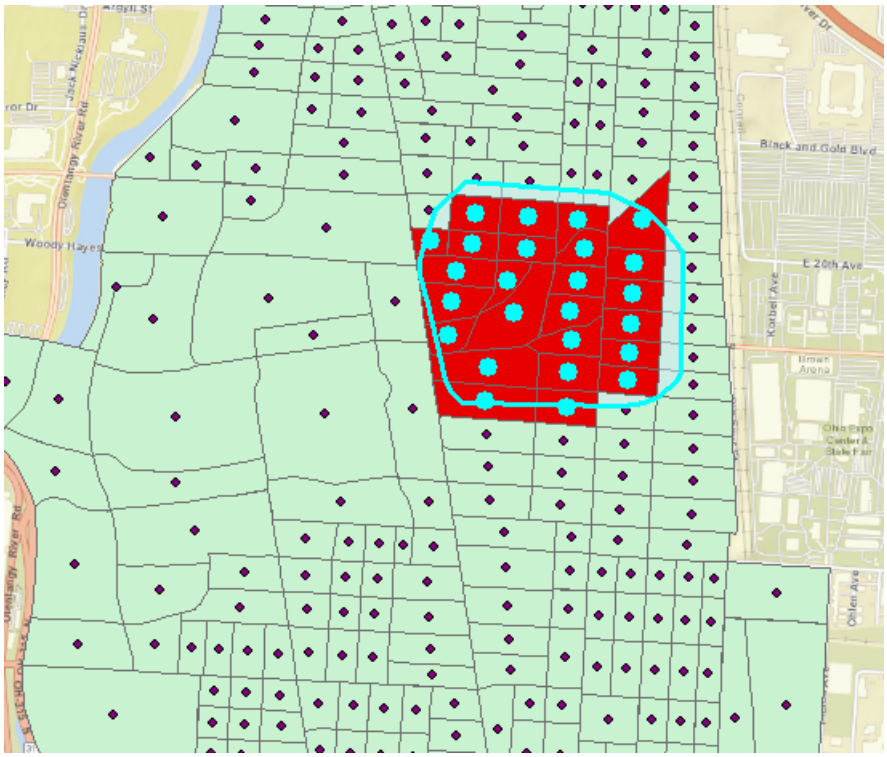



Figure 3.9 Example of the selected blocks inside a perceived neighborhood boundary

I used virtual auditing using Google Street-View to gather the physical attributes of each resident's perceived neighborhood boundary. I did the observations in two phases. Phase one (from October 2013 to February 2014) covered a comprehensive set of physical attributes. The setting for Phase one was Italian Village and a distinct part of University Area called Wieland Park (See figure 3.10). Weinland Park is a low-income community located at the Southern part of University Area. It has the lowest median household income ($26,870) and lowest median rent ($495) amongst the studied

neighborhoods[4] (Note that I measured some of the attributes, such as sidewalk length, treeline length, sidewalk lawn length and built density, using ArcGIS).

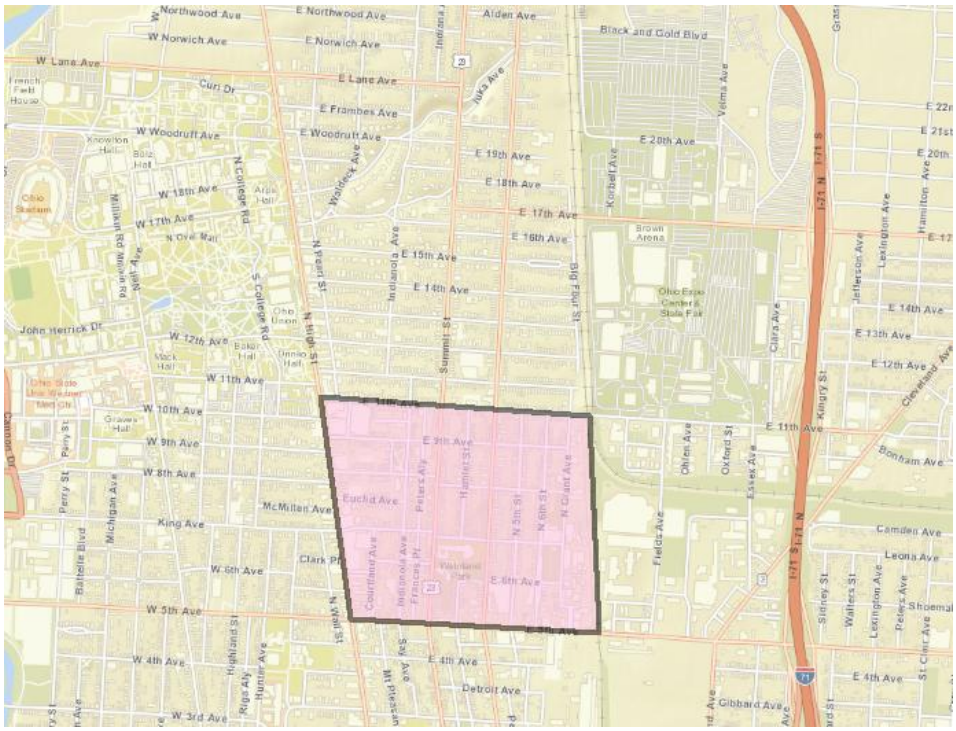



Figure 3.10 Weinland Park located south of University Area

In Phase Two (from late February to June 2014) I assessed the rest of University Area, but reduced the number of physical attributes to a sub-set of previous attributes. For Phase two, I reduced the physical attributes, because the Phase one observations took too much time making them impractical for future and applied work, and because a preliminary analysis showed some of the attributes (such as housing style, order, and walkability) as skewed and not correlated to place attachment scores and/or the

[4] These are the 2011 values according to www.city-data.com

underlying factors of place attachment (see Appendix D). Finally, I used residents input to make final decisions on the physical attributes. Residents often mentioned the following as the physical aspects they deemed special: shops, eating places, churches, parks, trails with natural elements, porches, walkable areas, and the quality of architecture. See Appendix C for some of the residents' descriptions on their special places/areas.

Table 3.5
Observed attributes in each of the two phases

| Attribute | PHASE 1 | PHASE 2 |
|---|---|---|
| Upkeep | | |
| | Dilapidated buildings | Dilapidated buildings |
| | Graffiti | Graffiti |
| | Real estate signs | |
| | Dilapidated public features | |
| | Poles and overhead wires | |
| Walkability | | |
| | Street treeline length | Street treeline length |
| | Sidewalk lawns length | Sidewalk lawns length |
| | On-street parking length | On-street parking length |
| | Street material | Street material |
| | Street lights | Sidewalk length |
| | Car-lines | |
| | Sidewalk length | |
| | Sidewalk condition | |
| | Street width | |
| | Sidewalk lawn width | |
| | Street furniture | |
| | Street median | |
| Housing style | | |
| | Pitched roofs | Porches |
| | Porches | Multi family |
| | Number of floors | |
| | Fences | |
| | Single family | |
| | Duplex | |
| | Multi family | |
| Destinations | | |
| | Coffee shops | Eating places |
| | Grocery stores | Shopping places |
| | Bars | Outdoor dining |
| | Restaurants | Churches |
| | Entertainments | |
| | School | |
| | Church | |
| | Outdoor dining | |
| | Errands | |
| | Shops | |
| | Banks | |
| | Pharmacy | |

Continued

Table 3.5 Continued

| | | |
|---|---|---|
| Order | | |
| | Same color<br>Same height | |
| Attribute | PHASE 1 | PHASE 2 |
| Density | | |
| | Density of built environment | Density of built environment |
| Mixed of uses | | |
| | Percentage of commercial<br>Percentage of residential<br>Mix of uses Index | Mix of uses Index |
| Parks | | |
| | Number of parks in the neighborhood<br>Percentage of neighborhood covered by parks | Number of parks in the neighborhood<br>Percentage of neighborhood covered by parks |

**Note*: The variable 'eating places' is the linear sum of restaurants, coffee shops, and bars. The variable 'shopping areas' is the linear sum of shops and errands.

By cutting the number of attributes from 43 to 19, I could inventory an average of ten blocks per day. With the full inventory, I could do five blocks per day.

### *Google Street-View Observations*

The current study is the first in place attachment research that used virtual environment for the physical inventory. Due to the omnidirectional camera system, Google Street-View allowed me to remotely navigate through 360' panoramic images at the street level, virtually explore the streetscape. Google Street-View is the most accessible form of panoramic imagery covering major cities (Kelly, Wilson, Baker, Miller, & Schootman, 2013). It offers a faster way of gathering the physical data than the physical auditing. Also, the absence of movement causing visual and audio nuisances (presence of people, moving cars, and urban wildlife) makes virtual auditing a more exact

way of gathering physical attributes of the environment. Compared to physical auditing, it allowed me to focus better on obtaining each attributes using the virtual auditing. In addition, it overcomes potential safety threats involved with taking physical inventories on-site. Finally, virtual auditing makes it easier to study the effects of physical attributes on place attachment in other cities and even countries, eliminating the need of travel or long stays at the study area.

Google Street-View can replace physical auditing (Badland, Opit, Witten, Kearns, Mavoa, 2010; Bronwen, Taylor, Fernando, Bauman, Williamson, Craig, & Redman, 2011; Clarke, Ailshire, Melendez, & Morenoff, 2010; Kelly, Wilson, Baker, Miller, & Schootman, 2013; Rundle, Bader, Richards, Neckerman, & Teitler, 2011). It is a more convenient way to gather data especially in bad weather (cold, rain or snow), making it more practical for cities to do. Virtual audit instrument can provide reliable physical indicators. Research shows that the results of measuring physical indicators using Google Street-View are similar to the in-person auditing (Clarke et al, 2010). A study compared the use of Google Street-View with physical auditing in street segments of five neighborhoods by the same trained researcher (Badland et al, 2010). It used SPACE (Systemic Pedestrian and Cycling Environment Scan), conceptual framework developed by Pikora et al (2002) to measure physical attributes that affect walking and cycling, for the streetscape items. It had direct physical measures of the settings including: items for pathways, streets, traffic, permeability, safety, aesthetic and view. The analysis confirmed agreement between the two kinds of measures with an interclass

correlation (ICC) greater than 0.7. Only two items, mix of uses and neighborhood permeability had lower interclass correlations.

Perkins, Meeks, & Taylor (1992) and Perkins, Wandersman, Rich, & Taylor, 1993) used physical auditing technique they called Block Environmental Inventory (BMI). They used a two-stepped data collection process. Step one contemplated the block as a whole, and step two looked at individual units. Hur (2010) followed the same routine. I used the virtual auditing technique but followed the physical auditing techniques used by Perkins et al (1992, 1993) and Hur (2010). I used a pen and paper physical inventory based on the Google street-View and developed tables with columns for each physical variable (See Appendix E). For each block, I scrolled forward and back a few times to get all the needed physical attributes. I used the same procedure as if I walked the blocks and recording the characteristics. I followed the two-step data gathering process of Neighborhood Physical Environment Inventory (NPEI) developed by Hur (2010). I used the block inventory for variables such as: quality of sidewalks, presence of treelines flanking sidewalks, presence of lawns flanking sidewalks, presence of on-street parking, dilapidated public features, poles and overhead wires, and street lights. I used the unit inventory to assess dilapidated housing, presence of graffiti, presence of porches, multi-family units, single-family units, duplexes, and presence of real estate signs. Because the present study focused on place attachment rather than walkability, I did not use all of the variables from the audits. Furthermore, because Google-Street-View lacks contemporary timing, I could not use it to assess the presence of litter or the presence of real estate signs. Items pertaining to environmental quality,

such as amount of litter are subject to individual perceptions, thus show lower reliability when measured via virtual auditing (Kelly et al, 2013).I eliminated these variables from upkeep and used poles and overhead wires, dilapidated housing, and graffiti. Each lasts longer and thus likely reflects the present situation. Overall studies have found Google Street-View as a valid indicator of on-site physical auditing (Bronwen et al, 2011; Clarke et al, 2010; Hannah, et al, 2010; Rundle, et al, 2011).

### *ArcGIS Measurements*

Although useful for counting, Google Street-View does not allow one to measure lengths and areas. I used ArcGIS analysis to calculate the area of neighborhoods, special places, parks, and closest distance between the respondent's home to the special place. I used the street network data file downloaded from ESRI (Census 2000 TIGER/Line Data). I also calculated building density and mix of uses, choosing the blocks which lay within each neighborhood. For the building density and mix of uses, I used the 2013 shape files available at the Knowlton School of Architecture website. I calculated building density by dividing the built area to the total neighborhood area. I followed Frank et al (2004) mix of uses index.

$$\text{Mix of uses Index} = -\sum \ln Pi(\ln Pi / \ln n) \qquad (3.1)$$

Where $n$ is the number of different land uses, $Pi$ is the proportion of land in type i in the region. For each neighborhood, this index gives a figure that indicates the level of mix use.

### *Perceived Boundaries*

Studies show that sense of place relates to subjective neighborhood boundaries (Bradley, Jorgenson, 2009; Hays & Kogl, 2007). Hays and Kogl (2007) demonstrated that the spatial scale of the neighborhood moderated the effects of tenure on collective action. As the first step in spatial analysis, they identified the neighborhood boundary. This dissertation adopted a definition of neighborhood that views functional, behavioral and affective components in a distinct geographic boundary (Examples are Eisenhauer et al (2000); Sullivan (1997)). Recall, I used a mapping exercise to have residents identify their neighborhood boundaries, and I had residents specify up to five special place (see Brown & Raymond, 2007). Although, it leads to a harder digitizing process, this method results in a more precise selection of these places/areas. Also, it allows for the collection of area data besides point data. These two mapping exercises represent cognitive and affective mapping, as the first has people describe places (boundaries) and the latter asks them about emotions associated with places. I then digitized the individual maps into ArcGIS. I used TIGER/Line-2013 street map as the base map for digitizing. The current study used the similar techniques used by Coulton et al (2001) for some of the physical attributes. (i) It measured the total area of special places for each resident and the percentage of each neighborhood covered with special places. (ii) It measured the linear distance from respondent's home to closest special place marked by the respondent.

## Analyses

### *Factor Analysis*

I performed Exploratory Factor Analysis to assess the factoral construct of place attachment. Based on the exploratory factor analysis factoral construct, I conducted Confirmatory Factor Analysis using the AMOS extension in SPSS. I used the maximum likelihood estimator derived from the covariance matrix. I adopted the place attachment construct developed by Kyle et al (2005) with a minor change. I added place satisfaction to their model. I let the four components of place attachment to inter-correlate. Studies have concluded that place identity and place dependence, although being positively correlated (Vaske & Kobrin, 2001; Williams & Vaske, 2003), do not always act uniformly (Bricker, Kerstetter, 2000; Kyle, Absher, & Graefe, 2003; Kyle et al, 2005). Kyle et al (2005) found that place identity and place dependence act independently.

As Lewicka (2011) argues, place attachment suffers from lack of theory. Thus, most research has contemplated exploratory analysis such as exploratory factor analysis and stepwise regression. Confirmatory factor analysis represents the best way to define a construct when there exist a solid theoretical evidence around that structure (Long & Perkins, 2003). Researchers usually perform this type of analysis based on theory and findings of exploratory factor analysis. Confirmatory factor analysis differs from exploratory factor analysis in assumptions and approaches (Albright, 2006; Anderson & Gerbing, 1998; Tartaglia, 2006). Exploratory factor analysis helps the researcher determine a preliminary structure in the dataset and number of factors. Confirmatory factor analysis tests the hypothesis about a particular factor structure and assesses

reliability and validity of the construct (Hatcher, 2005; Long & Perkins, 2003; Long, 1983, Wilkinson, 2007).

Factor analysis has two inter-related parts: regression model and correlation structure. Partial correlation is an idea that connects the two aspects of factor analysis. The regression model for factor analysis is

$$y_1 = \lambda_1\xi + e_1 \qquad (3.2)$$

$$y_2 = \lambda_2\xi + e_2$$

.

.

.

$$y_p = \lambda_p\xi + e_p$$

Where $\lambda_j$ is the regression coefficient for the regression of $y_j$ on the factor, $e_j$ is residual and $\xi$ is the common factor.

The matrix presentation is:

$$y = \lambda\xi + e \qquad (3.3)$$

The vectors are defined as the following: $y = (y_1,\ldots, y_p)'$, $e = (e_1,\ldots, e_p)'$, and $\lambda = (\lambda_1,\ldots, \lambda_p)'$.

It has three assumptions: i) The error term must have a mean of zero or $E(e) = 0$ ii) the number of observed variables in $y$ must be greater than the number of common factors in $\xi$ iii) the common and unique factors are uncorrelated, or $E(\xi\, e) = 0$.

This is the general equation for however number of factors. The correlation matrix illustration is:

$$P = \Lambda\Phi\Lambda' + \theta \qquad (3.4)$$

Where P is a *p*p* matrix of correlations in the population, Φ is a diagonal matrix of correlations between factors, Λ is the matrix of factor coefficient, and θ is the covariance matrix of residuals.

If the model applies in the population, then we have

$$\rho(y_j, y_k \,.\, \xi) = \text{corr}\,(e_j\,,\, e_k) = 0 \qquad (3.5)$$

Factor analysis is a convenient way to reduce a set of variables to smaller set of factors that explain the variation in the data set to a good degree. Looking for a factoral structure among landscape-based values, Brown and Reed (2000) performed factor analysis to see whether they could reduce the set of thirteen landscape-based values (aesthetics, economic, recreation, life sustaining, learning, biological diversity, spiritual, intrinsic, heritage, future, future, therapeutic and wilderness) to a smaller set of variables. They found that a new set of six factors explained around 60% of the variation. A study used confirmatory factor analysis to compare a four-factor model to a one-factor model of sense of place (Long & Perkins, 2003). Based on previous research, the investigators let the latent variables correlate, but did not let the items to factor loadings correlate. Due to the unacceptable model fit, they redid their analysis using exploratory factor analysis. Results revealed a three-factor model underlying the construct. Contemplating four and five dimension models of place attachment, Hammitt et al (2006) compared the mean differences among the respective dimensions. Using confirmatory factor analysis, they concluded that five-dimension model explained more variation in the dataset. They also compared all the paired dimensions and found that they were significantly different from

each other. Another study considered a sense of place model comprised of place attachment, place identity and place dependence (Jorgensen & Stedman, 2006). Factor analysis supported the presence of three factor in the construct. They found medium to high correlations among the three factors.

### *Number of Factors and Construct Validity*

Scholars use various tests and criteria to determine the number of factors. Most studies begin this process with choosing factors with Eigen Values higher than 1 (Arnberger, 2012; Bricker & Kerstetter, 2000; Brown & Reed, 2000; Hammitt, Backlund, & Bicxler, 2006; Kearney, 2006; Raymond, Brown & Weber, 2010). Some studies called for factor loadings larger than 0.4 and also sought the item loadings on more than one factor to differ by more than 0.1 in the loadings to be obtained (Hammitt, Backlund, & Bicxler, 2006; Raymond, Brown, & Weber, 2010). Arnberger (2102) used loadings higher than 0.45. The items within each factor must be highly correlated also. Williams and Vaske (2003) chose to adopt a four factor model, even though only three of the Eigen Values exceeded 1.0. They did this for several reasons. The four-factor model accounted for higher covariance. Variables had higher communalities. Factors were more replicable across samples. According to the principle of parsimony, one should stop the process of increasing factors soon as a further increase does not yield a significant improve of fit (Akaike, 1987).

When testing the plausibility of factor analysis, one should consider item intercorrelation within each factor. Studies use Cronbach alpha test to measure the

intercorrelation among items. Arnberger (2012) argued for a Cronbach alpha of higher than 0.60. Most important determinant of factors and loadings are a battery of tests that are generally called tests of model fit. I will describe them in detail in the structural equation model section.

Construct validity tries to reveal the fit of measure to theory. Studies use two reliability indexes: the indicator reliability and composite reliability. The former refers to consistency of measurement or the amount of variation in the observed variable which is explained by the factor. The composite reliability, refers to the internal consistency of indicators that measure a given factor (Hatcher, 2005). It is a similar measure to inter-item coefficient alpha. A value of 0.7 or higher indicates acceptable reliability.

$$\frac{(\sum Li)^2}{(\sum Li)2+\sum Var\,(Ei)} \qquad (3.6)$$

Where $L_i$ = the standardized factor loadings for that factor

*Var* ($E_i$) = the error variance associated with the individual indicator variables

Williams and Vaske (2003) tested the construct validity in two ways. Using confirmatory factor analysis, they determined the fit of the two-dimensional structure of attachment comprised of dependence and identity. They examined the extent to which the measure behaved in parallel to theory using correlation analysis. Thus, variables hypothesized related to the construct should be positively related. Some studies have used cross validation to examine model validity (Kyle et al, 2006; Byrne, Shavelson, & Muthen, 1989; Cudeck & Browne, 1983). This method splits the sample in two groups

and tests for the equivalence of factor covariances and structures across the two subsamples. However, this method needs a larger sample size. Cross-validation has been used extensively to examine linear regression equations. The covariance models have incorporated this method also. If the same model yields the lowest cross-validation index, then this model can be chosen. In large samples, saturated models usually yield better fit criteria. However, one can pick the more parsimonious models, if there's small difference in cross validation indices (Cudeck & Browne, 1983). In social sciences, scholars should only consider models as approximation of reality rather than exact truth. Thus, their effort should be mostly concentrated on finding reasonable approximation to data while relaying more on theoretical background. Generalizability is an extension of classic reliability theory for psychological measurements. A good place attachment measure should generalize across the items underlying each dimension. Researchers in place attachment need to examine generalizability in three facets: persons, dimensions and areas (Williams & Vaske, 2003).

### *The Hypothetical Confirmatory Factor Analysis Models in the Study*

I have illustrated the hypothetical confirmatory factor analysis models in Figure 3.11. These relationships are based on the reviewed literature on place attachment construct and factors associated with place attachment. It's worth noting that I have not proceeded with any calculations and this model solely displays the relationships found in the literature so far. I will try to base my final model/s upon these illustrated relationships

(Physical attributes are illustrated in light blue, social attributes in green and place attachment factors in dark blue).

It has twelve latent variables and 36 observed variables. The latent variables *place dependence*, *place satisfaction*, and *social bonding* are each measured by three different observed variables. However, *place identity* is measured with four observed variables. I expected to retain six of the seventeen observed physical factors (*upkeep, walkability, housing style, destinations, park* and *special*); two of the five social factors (*social ties* and *tenure*); and one of the two perceived factor (*special places*).

I retained the social factor *tenure* from *length of residence, age* and *homeownership*. Studies suggested that these attributes are main predictors of place attachment (Arnberger & Eder, 2012; Brown & Raymond 2007; Clark & Stein, 2003; Comstock, Miriam, Marshall, Soobader, Turbin, Buchenau, & Litt, 2010; Sampson, 1988; Stedman et al, 2010; Trentelman, 2011). The other social factor *social ties* is retained from observed variables *number of neighbors known by name* and *number of group memberships*. Studies show that these factors affect place attachment (Comstock et al, 2010; Eisenhauer et al, 2000; Lund, 2002; Mesch & Manor, 1998; Sampson, 1988; Wood, Frank, & Giles-Corti, 2010). The physical factor *upkeep*, retained from observed variables *dilapidated buildings* and *graffiti*, has mainly shown effects on place satisfaction (Galindo & Hidalgo, 2005; Handy et al, 2002; Levi, 2005; Nasar, 1984, 1985). The physical factor *walkability*, retained from observed variables *presence of sidewalk, presence of lawns flanking sidewalks, presence of treelines flanking sidewalks, on-street parking,* and *street material*, is deemed to affect neighborhood satisfaction and

attachment (Day et al, 2006, 2011; Handy et al, 2002; Nasar, 2008). The physical factor *housing style*, retained from observed variables *presence of porches* and *multifamily buildings*, is shown to affect place attachment (Lund, 2002; Plas & Lewis, 1996). The physical factor *destinations*, retained from observed variables *presence of shops, eating places, outdoor dining area*, and *churches*, have proved significant predictors of place attachment (Francis, Giles-Corti, Wood, & Nuiman, 2012; Kweon, Sullivan, & Wiley, 1998; Talen, 2000). It must be noted that these studies referred to *destinations* as *public spaces*. The physical factor *parks*, retained from the observed variables *number of parks in the neighborhood* and the *percentage of neighborhood area covered by parks*, is also shown as a predictor of place attachment (Handy et al, 2002; Plas & Lewis, 1996). Studies on public spaces and their effect on place attachment have pointed to the subjective factor *special*, retain from the *closest distance to a special place* and the *percentage of neighborhood covered by special places* as a significant factor (Eisenhauer et al, 2000; Francis et al, 2012; Shamai & Ilatov, 2004; Talen, 2000; Wood et al,, 2010).


Figure 3.11 The hypothetical confirmatory factor analysis model including physical and social variables alongside the place attachment factors

*Structural Equation Modeling*

I used structural equation modeling to predict the underlying factors in place attachment, retained from confirmatory factor analysis, from the observed and latent variables. The predictor variables were comprised of physical and social attributes. I opted for a multidimensional analysis using path models and structural regressions in AMOS extension of SPSS package. This model allowed me to assess the effects of multidimensional constructs on each other and eventually on place attachment.

I opted for a two-step method of modeling process. I started with exploratory factor analysis and confirmatory factor analysis on the thirteen place attachment items and some of the exogenous and endogenous variables. The second step involved developing paths between the latent and observed variables. Just as the current study design, many others start with confirmatory factor analysis then progress to a structural equation model. Bonaiuto et al (1999) used factor analysis to reduce variables in a set of 126-items. They then constructed a structural equation model in which six factors mediated the effects of socio-demographic variables to place attachment.

Other researchers have used structural equations in modeling place attachment and sense of place (Flaherty, 2010; Sampson, 1998; Stinner, Van Loon, Chung, & Byun, 1990). Although researchers have frequently used regression analysis (Arnberger & Eder, 2012; Francis et al, 2012; Lewicka, 2010; Lund, 2002; Raymond & Brown, 2010; Stedman, 2002), structural equation models, with the consideration of mediating variables, provide more flexible data modeling and hypothesis testing. Thus, structural equations represent the best model to capture these effects. Bonaiuto et al (1999) found

that although socio-demographic variables affect place attachment, the effects are more indirect and through the perceptions of the physical environment. Others have advocated structural equation models usage for its capabilities in capturing various direct and indirect effects through mediating and moderating variables (Amerigo & Aragones, 1997; Bradley & Jorgenson, 2009; Hur, 2010; Nasar, 2006). Studies argue that perceived attributes of the environment mediate the effect of physical environment, which in turn fortifies the rationale behind using such models (Hur, 2010; Nasar, 2006). Vaske and Kobrin (2001) argued that place identity mediated the effect of place dependence on environmentally responsible behavior (ERB).

Moderator variable partitions (or moderates) an independent variable into sub-groups to establish maximum effect to a dependent variable, but mediator variable accounts for the relationship between a predictor (or independent) and criterion (or dependent) variable (Baron and Kenny, 1986). For example, "mediators explain how external physical events take on internal psychological significance." (Baron & Kenny, 1986).

Structural equation models are also used in residential satisfaction research (Amerigo & Aragones, 1997; Ellen & Turner, 1997; Sirgy & Cornwell, 2002) and behavior research (Clark & Ledwith, 2006; Fang, 2006; Ge & Hokao, 2006). OLM and multiple regression models cannot explain these types of complex relationship. Thus, research in these fields requires path models, factor analysis, principal component, cluster analysis or a combination of some of these techniques (Amerigo & Aragones, 1997;

Bruin & Cook, 1997; Galster & Hesser, 1998; Newman & Duncan, 1979; Weidemann & Anderson, 1985).

As Cudeck (2012) argues, the domain of structural equation model has two major distinguishing themes. Regression, as the first theme, is observed everywhere in structural equation models. The second approach states that variables are made up of dependable information (signal) and irrelevant information (noise). Structural equation models use various regressions (path diagrams) to connect exogenous variables to endogenous variables. Some structural equation models incorporate latent variables. These are variables that cannot be directly measured. They come in various kinds: a true score, factor analysis-type factor, and a generic latent variable. Indicating the underlying factors, the structural equation models were developed by incorporating latent and observed variables (See Bonaiuto et al, 1999; Hatcher, 2005; Hur, 2010; Sabiston & Crocker, 2008). Others define structural equation models in a similar way. Bradley and Jorgenson (2009) assert that structural equation models consist of two sub-models: measurement model, which link indicators to latent variables, and structural model, which determines the relationship among latent variables.

### *Model Identification*

Model identification is a part of structural equations. A model is said to be identified if it can offer unique estimate of each variable (Kline, 2004). Some Structural equation models can be estimated with sample data, but others cannot. Model identification determines whether it is possible to estimate the model. In other words, is

the model specific enough to describe real data? There are three requirements that an identified model needs to meet. First, the number of free parameters must be less than the number of observations. In other words, model must have a non-negative degrees of freedom ($df_M \geq 0$).

$$df = p(p + 1)/2 - q \qquad (3.7)$$

where $q$ is the number of parameters and p is the number of variables, $p(p + 1)/2$ is the maximum number of model parameters.

Second, every latent variable should have a scale. Third, the model should have more than one indicator to it. Structural equation models need to be saturated to become identified. Thus, every structural variable needs to be connected to every other structural variable through a causal or covarying path (Hatcher, 2005).

### *Goodness of Fit Indexes*

In testing model fit, the current study contemplated more than one criteria. It started assessing the goodness of fit with checking the Chi-square value. This value determines the discrepancies between the observed covariance matrix and the covariance matrix produced by the model. A nonsignificant value of Chi-square is desired to approve the goodness of fit (Millis, Malina, Bowers & Ricker, 1999). However, no single index can adequately assess the model fit (Millis, Malina, Bowers & Ricker, 1999; Werts, Linn & Joreskog, 1974). Any model will be rejected with a sufficiently large sample size (Cudeck & Browne, 1983). If Chi-square is large compared to degrees of freedom, then the null hypothesis will be unattainable and the alternative hypothesis will be accepted.

Thus, it is not uncommon to report as many as three different fit criteria. There are occasions that models are chosen because they have 'smallish' residual covariances, or smaller discrepancy function. There's no correct model, only best approximations. In assessing the goodness of fit, I further checked the models with other criteria such as Chi-square to *df* ratio, GFI, TLI, BIC and RMSEA.

An aspect of structural equation model analysis is fitting the model to data and not the other way around! One fits models to data to understand the underlying operating process. Useful models are parsimonious and clearly understood. One pitfall is improving model fit with adding meaningless parameters (Browne & Cudeck, 1992). The process of fitting a model to data begins with theoretical concept about connections between variables. In assessing model fit, one needs to check two kinds of results: ability of model to account for sample covariance matrix, and the ability of model to predict each dependent variable. One should always examine the former first. Fitting the model means to make the sample covariances as close as possible to the covariances estimated by the model. In other words, make the elements of matrix of S - M(θ) as close to zero as possible. Where S is the sample covariance matrix and M(θ) is the covariance estimated by the model.

Consider *m* as the number of parameters in θ, and let *p** be the number of elements in the covariance matrix. A structural equation model is mostly interesting if m is smaller than *p**. Structural equation model is ultimately looking to account for the covariance matrix parsimoniously. This means the degrees of freedom should be as large as possible (remember $df = p^* - m$).

Using Chi-square as the indicative of fit can be misleading. It is highly sensitive to departures from multi-variate normality. It is sample-size sensitive. In large complex models, the observed Chi-square will nearly always be significant, even if there's a reasonably good fit to the data (Bentler, 1990; Byrne, Shavelson & Muthen, 1989; Marsh & Hocevar, 1985; Millis, Malina, Bowers, & Ricker, 1999; Tanaka, 1987). More complex models with more (than twelve) parameters will also reject the Chi-square (Hair, Black, Babin, Anderson, & Tatham, 2006).Thus, assessing model fit requires a subjective evaluation to see if the significant Chi-square is small enough to constitute an acceptable fit. Most models are rejected even with small residuals. Some studies have used the Chi-square to *df* ratio (Arbuckle & Wothke, 1999, Long & Perkins, 2003). They suggest a variety of cut offs for acceptable fit; 2 to 5 (March, Hocevar, 1985) below 2 (Arbuckle & Wothke, 1999) and below 1 (Tanaka, 1987). Research has contemplated other indexes that represent model fit: GFI, TLI, BIC and RMSEA are mostly used. Goodness of fit index (GFI) range from 0 to 1with the desirable values over 0.90 (Long & Perkins, 2003). It is an index of absolute fit which provides an index of relative amount of variance that's accounted for by the model (Millis et al, 1999). The Tucker Lewis index (TLI) is based on Chi-square distribution. It ranges from 0 to 1 and values above 0.9 are desirable. The Bayes conformation Criterion (BIC) is useful for comparing models and chose the number of factors leading to better fit. It assesses model fit from a different angle. BIC is used for model comparison and its value can't be interpreted separately. Better fitting models have lower BIC values. If the BIC difference is less than 4.6, there's a weak evidence for the model with lower BIC value. If the BIC difference lies within 4.6-9.2,

there's strong evidence for the model with lower value of BIC. Difference of over 9.2 offers conclusive evidence for the model with lower BIC (Kass & Raftery, 1995). Root mean square of error approximation (RMSEA) developed by Steiger (1990) assesses the discrepancy model and the data per degree of freedom for the model. There's an overall agreement on RMSEA guidelines: <.05 = good fit; .05 to .08 = acceptable fit; .08 to .10 = marginal fit; > .10 = poor fit (Browne & Cudeck, 1992).

$$\varepsilon = \sqrt{\frac{F0}{df}} \qquad (3.8)$$

Where $\hat{\hat{F}}_0$ is an unbiased estimator of $F_0$ : ($\hat{\hat{F}}$ - ($df$/$N$-1)).

$\hat{F}$ is the discrepancy function value of the approximating model to R in the sample denoted as $\hat{F}$: < R, M($\hat{\theta}$) >, and $df$ is the degrees of freedom.

Since $\hat{\hat{F}}_0$ generally decreases when one adds more parameters to the model. Controlling for the degrees of freedom makes RMSEA a helpful criterion. Research generally agrees on using RMSEA over many other indexes because it reflects the view that the studied model is an approximation of reality (Fuentes, Hart-Johnson, & Green, 2007; Kline, 2005; MacCallum, & Austin 2000).

### *Sample Size*

I obtained a sample of 143 residents of University Area and Italian Village. Based on the number of variables used in the model, the present sample size could prove to be sufficient or not. A rule of thumb in regression modeling says that one needs 10 samples per parameter (Tanaka, 1987). Models comprised of 14 variables or less comply with this

rule. Developing a general model of place attachment, containing more than 14 variables, might exhibit some invalidity. Thus, I developed smaller models alongside the general model of place attachment.

A part of any analysis validation is based on the appropriate sample size. In fitting the model, inferences are made from observed data to the model believed to be generating the observations. These inferences depend on how the sample represents the population, which, in turn, depends on sample size. Larger sample size carries more confidence to the model as the reflection of population (Tanaka, 1987). Small sample sizes ($N < 100$) contain many specification errors.

Besides the ten-to-one ratio suggested by Tanaka (1987), others have developed a variety of rules for obtaining sample size. In his study of the effects of sample size on latent variable structural equation model, Boomsma (1983) suggested that the maximum likelihood estimator in these models requires sample size of at least 200. However, others have argued that smaller samples can provide robust results (Gebring, Anderson, 1985). Studying sample sizes in latent variable structural equation model, Tanaka (1984) found sample size of 100 to be the lower bound when considering ML estimators.

Unfortunately, choosing the right sample size is not an easy task when it comes to structural equation models with latent variables. Here, one is looking for a small value of Chi-square per degree of freedom for accepting the model fit. Larger samples tend to increase the discrepancy Chi-square and thus, rejecting the model which, in fact, deviates from the population in a trivial way (Tanaka, 1987).The problem of sample sizes exacerbate when one is dealing with non-normal data. Normal data could be explained

through means, variances and covariances. However, non-normal data needs fourth order moments such as kurtosis to estimate models, which in turn needs larger sample sizes (Tanaka, 1987).

### *Autocorrelations*

The current study assessed the autocorrelation of five variables: the average values of four place attachment factors alongside the single place attachment item ("I feel attached to this neighborhood"). Autocorrelation assesses whether attributes with spatial proximity exhibit correlations. It checks the covariation of properties in space. Using ArcGIS, I created percentile maps for each variable. I used Anselin, Syabri and Kho (2006) GeoDa 1.6.7 package (downloaded from https://geodacenter.asu.edu/software/downloads) to calculate univariate Moran's I as the universal autocorrelation score. GeoDa is an open source software with the graphical spatial analysis intent. It carries out exploratory data analysis and spatial autocorrelations and spatial regression. Moran's I reveals whether residents living close together exhibit similar values of the variables. It is one of the oldest indicators of spatial autocorrelation. It compares the value of the variable at any location with the value of the same variable at all other locations. Moran's I varies between -1 and 1. A high value indicates positive autocorrelation or dependence and clustering. Negative autocorrelation means competition and repulsion. The popularity of Moran's I is due to asymptotic normal distribution of the model as *n* increases (Anselin & Rey, 2010).

$$I = \frac{n \sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{[\sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij}][\sum_{i=1}^{n} (x_i - \bar{x})^2} \qquad (3.9)$$

Where n is the number of areal units

$x_i$ and $x_j$ are variables at particular location *i* and *j*

$w_{ij}$ is the weight applied to the comparison between location *i* and *j*

One can define the weights $w_{ij}$ in various ways. Two of the most frequent weight matrices are binary connectivity and distance function. In binary connectivity, $w_{ij} = 1$ if area *i* is adjacent to area *j* and $w_{ij} = 0$ otherwise. In distance function, $w_{ij}$ is a function of inverse distance between areas *i* and *j*. Other spatial weight functions include: lengths of shared borders divided by perimeter; n nearest neighbors; ranked distances and all centroids within distance *d*.

In GeoDa, the universal Moran's I is visualized by means of a Moran scatter plot in which the slope corresponds to Moran's I. Permutation tests (as many as 9999) are used to assess the significance of Moran's I. Local patterns are illustrated in the form of cluster maps (Anselin, Syabri, & Kho, 2006). Positive spatial autocorrelation indicates that cases exhibit the same value of a variable as the spatially lagged ones do. This would indicate clustering of high values, low values, and medium values. An example is the high crime areas surrounded by other high crime areas. On the other hand, contrasting values between spatially lagged cases indicates negative spatial autocorrelation. An example is the high crime areas surrounded by low crime areas (Leitner & Brecht, 2007).

# CHAPTER 4

# RESULTS

As the variables in the model should vary and have a normal distribution, I first tested their variability and skewness. Overall, the social variables displayed acceptable levels of variability and normality, but approximately half of the physical variables did not. In Appendix F, I summarize the skewness indexes, *p* values and the coefficients of variation of the physical variables. In Appendix G, I summarize the means and standard deviation of physical attributes. In the following sections, I report the results for the six hypotheses from the introduction.

## Is place attachment a multi-factoral construct?

The results revealed that place attachment had a multi-factoral structure consisting of *place identity, place dependence, place satisfaction* and *social bonding*. Thus, I used the four-factor model ($\chi^2$ = 239.9, *df* = 32, *p* = 0.000). Furthermore, confirmatory factor analysis supported the presence of four factors. In parallel to other place attachment studies (Jorgensen & Stedman, 2006; Long & Perkins, 2003; Williams, Anderson, McDonald, & Patterson, 1995; Williams & Vaske, 2003), I allowed the factors to inter-correlate. For this, I used a Promax oblique rotation. Although the initial exploratory

factor analysis revealed a three factor construct ($\chi^2 = 58.59$, $df = 42$, $p = 0.046$), it is hard to interpret the three-factor results.[5]

In Table 4.1, I show the factor loadings of the Promax rotation for each of the four factors. For each factor, the items loading on it had high inter-item reliability (place identity, $\alpha = 0.76$; place dependence $\alpha = 0.82$; social bonding, $\alpha = 0.80$; place satisfaction, $\alpha = 0.74$). Thus, for each factor I used the mean of each set of items loading on it to create a scale. For example, for Place Identity, I averaged items 1, 4, 9 and 12 to get a Place Identity score.

[5] Some of the factor items do not match the findings in literature. The factor analysis with three factors had a third factor, besides place dependence and place identity, that collapsed place satisfaction and social bonding, two factors considered separate in previous research (Adriaanse, 2007; Comstock et al, 2010; Nasar & Julian, 2009; Raymond, Brown, & Weber, 2010).

Table 4.1
Factor Loadings

| Item (intended dimension) | Factors: Place Identity | Place Dependence | Social Bonding | Place Satisfaction |
|---|---|---|---|---|
| (1)I feel attached to my neighborhood (PI) | **1.00** | 0.04 | -0.14 | 0.04 |
| (4) My neighborhood says very little about who I am (PI)* | **0.44** | 0.05 | 0.16 | -0.01 |
| (9) It wouldn't really be that bad if I and the people who I appreciated in the neighborhood moved out (PI)* | **0.57** | 0.15 | -0.05 | -0.21 |
| (12) This neighborhood means a lot to me (PI) | **0.62** | 0.031 | 0.157 | 0.09 |
| (5) I wouldn't substitute any other neighborhood for the type of activity I do here (PD) | -0.03 | **0.74** | 0.06 | 0.03 |
| (7) There are better places to be than my neighborhood (PD)* | 0.13 | **0.72** | 0.04 | -0.05 |
| (2) My neighborhood is the best area for doing the things that I enjoy most (PD) | 0.16 | **0.54** | 0.04 | 0.12 |
| (8) Being a member of this neighborhood is like being a member of a group of friends (SB) | 0.02 | -0.04 | **0.91** | -0.02 |
| (13) People here know they can get help from others in the neighborhood (SB) | 0.10 | 0.14 | **0.55** | -0.11 |
| (10) This is not a close-knit neighborhood (SB)* | -0.14 | 0.11 | **0.49** | 0.11 |
| (11) I am satisfied with my living environment (PS) | -0.16 | 0.12 | -0.04 | **1.00** |
| (6) The layout of this neighborhood is convenient (PS) | 0.40 | -0.28 | 0.09 | **0.44** |
| (3) I feel like I can be really myself in my neighborhood (PS) | 0.28 | 0.24 | 0.07 | **0.28** |

**Note*: The scores for these items were reversed

*Confirmatory Factor Analysis*

In the next step, I tested the results of the exploratory factor analysis using s confirmatory factor analysis. I sought to confirm the four-factor structure amongst the thirteen place attachment items, The four-factor Confirmatory Factor Analysis model, which included *place identity, place dependence, place satisfaction* and *social bonding* as factors, had an acceptable fit to the data. With the factors allowed to inter-correlate, the model had high factor loadings and statistical significance at the.05 level. Confirmatory factor analysis satisfied the identification requirements. In Table 4.2, I summarize the multiple goodness of fit indexes for the final confirmatory factor analysis model. I estimated the confirmatory factor analysis model through a maximum likelihood method of estimation (see Figure 4.1).

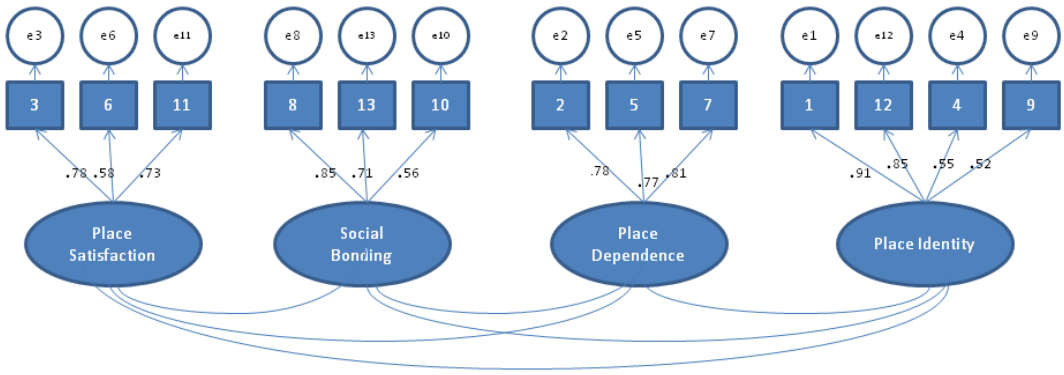



Figure 4.1 Confirmatory factor analysis model of place attachment (Chi-square/df <2, p = 0.001, RMSEA = 0.056).
**Note*:

- Paths appear on single-headed straight arrows; correlations appear on curved lines
- All paths are statistically significant at the $p < .001$ level

- Standardized path coefficients appear on arrows indicating the strength of associations
- Observed variables 1 to 13 refers to the thirteen place attachment items
- Refer to the left column in Table 4.1 for description of each item

To assess the factor validity, I assessed the fit of the confirmatory factor analysis using eight indicators ($\chi^2$, *df*, $\chi^2$/ *df*, *p*, CFI, IFI, TLI, and NFI**,** see Table 4.2), all of which indicated a good fit. Although the Chi-square statistics is rejected at the.05 level, the ratio of Chi-square/*df* ratio falls under 2, indicating an acceptable fit (Arbuckle & Wothke, 1999). The CFI, TFI, NFI and IFI values are over 0.9, showing acceptable fit (Bentler, 1992, Bollen, 1989). Finally the Root-Mean-Square of Error Approximation (RMSEA) of 0.056 indicates acceptable to great fit. Factor loadings are all significant at the.001 level (see table 4.3). Overall the factors complied with the predicted patterns and constructs in place dependence and social bonding. However, the place identity and place satisfaction factors exchanged one item. I intended item 3, "I feel I can be really myself in my neighborhood" to load on the place identity factor (Jorgenson, 2006), and I intended item 9, "It wouldn't be really that bad if I and the people who I appreciated in the neighborhood move" to load on the place satisfaction factor (Hidalgo & Hernandez, 2001). The latter item has dual meaning that one could categorize under satisfaction and identity. However, the former item has usually been stated as a place identity item.

Table 4.2
Goodness of fit for each model

| Model | $\chi^2$ | *df* | $\chi^2$/*df* | *p* | CFI | IFI | TLI | RMSEA |
|---|---|---|---|---|---|---|---|---|
| Confirmatory factor analysis | 85.58 | 59 | 1.45 | 0.013 | 0.97 | 0.97 | 0.95 | 0.056 |

Table 4.3
Factor loadings and significant levels for the confirmatory factor analysis model with four factors

| | | | Estimate | *S.E.* | P |
|---|---|---|---|---|---|
| 2 | <--- | Place Dependence | .78 | .09 | .001 |
| 5 | <--- | Place Dependence | .77 | .08 | .001 |
| 7 | <--- | Place Dependence | .61 | .08 | .001 |
| 8 | <--- | Social Bonding | .85 | .09 | .001 |
| 13 | <--- | Social Bonding | .71 | .09 | .001 |
| 10 | <--- | Social Bonding | .56 | .10 | .001 |
| 3 | <--- | Place Satisfaction | .78 | .09 | .001 |
| 6 | <--- | Place Satisfaction | .58 | .08 | .001 |
| 11 | <--- | Place Satisfaction | .73 | .08 | .001 |
| 1 | <--- | Place Identity | .91 | .08 | .001 |
| 12 | <--- | Place Identity | .85 | .08 | .001 |
| 4 | <--- | Place Identity | .55 | .10 | .001 |
| 9 | <--- | Place Identity | .52 | .09 | .001 |

Table 4.4
Correlation matrix of the thirteen place attachment items

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.00 | | | | | | | | | | | | |
| 2 | 0.58 | 1.00 | | | | | | | | | | | |
| 3 | 0.62 | 0.55 | 1.00 | | | | | | | | | | |
| 4 | 0.52 | 0.47 | 0.43 | 1.00 | | | | | | | | | |
| 5 | 0.49 | 0.59 | 0.48 | 0.28 | 1.00 | | | | | | | | |
| 6 | 0.53 | 0.34 | 0.40 | 0.39 | 0.23 | 1.00 | | | | | | | |
| 7 | 0.56 | 0.58 | 0.53 | 0.41 | 0.63 | 0.26 | 1.00 | | | | | | |
| 8 | 0.53 | 0.48 | 0.48 | 0.42 | 0.47 | 0.35 | 0.49 | 1.00 | | | | | |
| 9 | 0.49 | 0.40 | 0.25 | 0.42 | 0.23 | 0.23 | 0.36 | 0.30 | 1.00 | | | | |
| 10 | 0.28 | 0.40 | 0.31 | 0.32 | 0.27 | 0.26 | 0.35 | 0.45 | 0.28 | 1.00 | | | |
| 11 | 0.51 | 0.53 | 0.59 | 0.31 | 0.48 | 0.49 | 0.45 | 0.36 | 0.15 | 0.32 | 1.00 | | |
| 12 | 0.77 | 0.50 | 0.54 | 0.49 | 0.48 | 0.46 | 0.56 | 0.59 | 0.37 | 0.28 | 0.50 | 1.00 | |
| 13 | 0.46 | 0.38 | 0.39 | 0.32 | 0.43 | 0.24 | 0.44 | 0.58 | 0.21 | 0.35 | 0.26 | 0.47 | 1.00 |

Table 4.5
List of communalities of the thirteen place attachment items

| | Communalities |
|---|---|
| 1 | 0.73 |
| 2 | 0.56 |
| 3 | 0.54 |
| 4 | 0.39 |
| 5 | 0.53 |
| 6 | 0.39 |
| 7 | 0.55 |
| 8 | 0.53 |
| 9 | 0.34 |
| 10 | 0.31 |
| 11 | 0.52 |
| 12 | 0.66 |
| 13 | 0.41 |

## The Five Models of Place Attachment

The current study developed five structural equation models of place attachment. In addition to the general place attachment (GPA) model, it created four other models one for each factor in the confirmatory factor analysis: *place identity*, *place dependence*, *place satisfaction* and *social bonding*. All five models share some common characteristics. In all models, the latent variable tenure exhibits positive indirect relationships through the latent variable social ties. There are significant physical and social attributes in all five models. The most prevalently influential physical attributes are *graffiti*, *closest distance to special places* and *destinations*, while the most prevalently influential social attributes are *length of residence, homeownership, number of neighbors one knows by name,* and *number of group memberships*.

The GPA is a comprehensive model representing all four factors of place attachment. The study tried to establish various, direct and indirect, relationships between physical and social attributes and each of these factors. Although, successful at developing a model with acceptable fit that also explained high variations in each of the four factors, the GPA model did not satisfy the variable-to-respondent ratio. With 23 variables, the model needed a sample of 230 rather than the 143 in the present sample. Thus, I also developed the four smaller models, each of which had an adequate sample. Below I give a brief description of each model.

All models (place identity, place dependence, place satisfaction, and social bonding) had the physical and social attributes as predictors. The place identity and place dependence models each had an acceptable fit and predicted over 50 percent of variation in its criterion variable. The place dependence model had more variables and the physical attributes showed stronger relationships than in the place identity model. The place satisfaction model had predictors similar to those in the place identity model with one difference. Instead of the *education*, it had *church* as a predictor. Although, having a great fit, the model did not predict as well as the others (only about 39% of the variation in place satisfaction). Finally, social bonding had a great fit and predicted over 60% of variation in social bonding (the highest R-square of the models). The following section describes each model separately and in more detail.

*The General Place Attachment Model (GPA)*

In the GPA model, most of the independent variables are related to at least two of the four factors (place identity, place dependence, place satisfaction, and social bonding), but some predictors are related to only one factor. The model has six exogenous and twenty three endogenous variables. The exogenous variables, which are all manifest variables, include *education, closest distance to special place, graffiti, church, destinations* and *age*. The endogenous variables include the four components of place attachment and the thirteen items that make up those components plus two latent social variables, *tenure* and *social ties* and their corresponding observed variables: *homeownership, length of residence, number of neighbors one knows (n.neighb),* and *number of group memberships (n.groups).* Each endogenous variable has a disturbance term. The model shows a causal straight single headed arrow down from the disturbance term to each endogenous variable. Associations between variables are illustrated by a straight single-headed arrow.

This model (see Figure 4.2) shows the four place attachment factors toward the right. Look at the first, Place Identity. It consists of four items (1, 12, 9, 4) shown to its right. The numbers by the four arrows show that factors 1 and 12 have the largest associations to Place Identity followed by factors 4 and 9. Looking to the left of Place Identity, you see that *social ties* and *education* are positively related to it, with *social ties* having the strongest relationships (.86) and you see that *closest distance to special place* and *graffiti* are negatively related to it, with the latter having the stronger relationship (-.19). Finally, moving further to the left you see that the latent predictor *social ties* is

associated to the latent predictor *tenure*. Although *social ties* is retained almost equally from *number of neighbors one knows by name* and *number of group memberships*, *tenure* is strongly retained from *length of residence* (.82) followed by *homeownership* (.65).

Below Place Identity, the GPA model has Place Dependence. It has three items (5, 2, and 7) shown on its right. The numbers by the three arrows show that each item has similar associations to Place Dependence. Looking to the left of Place Dependence, we see that *social ties* and *destinations* are positively related to it and *graffiti* is negatively related to it, and that *social ties* has the strongest relationship (.76).

Below Place Dependence, you can see Social Bonding. It has three items (13, 8, and 10). The numbers by the three arrows show that item 8 has the largest association with Social Bonding and item 10 has the smallest association with it. Looking to the left of Social Bonding, we see that Social Bonding is associated with *social ties*.

Finally, on the bottom of the GPA model, you see Place Satisfaction. It has three items (3, 11, and 6). The numbers by the three arrows show that among the three items, item 3 has the largest association to Place Satisfaction and item 6 has the smallest association. Looking to the left of Place Satisfaction, *social ties* and *church* are positively related to it *and graffiti* and *closest distance to special place* negatively related to it, with *social ties* having the strongest relationship (.72) followed by *graffiti* (-.32).

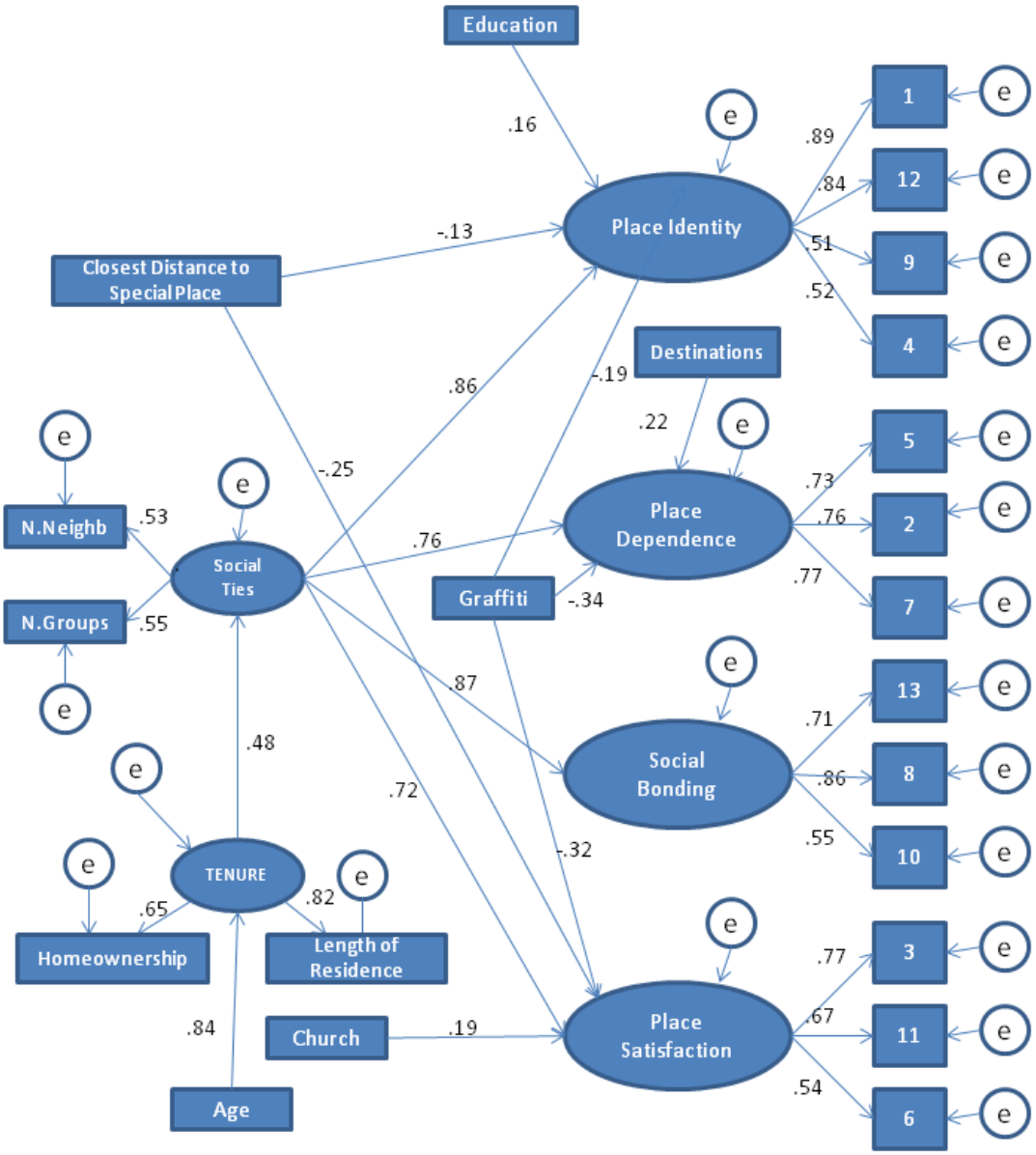



Figure 4.2 The General Place Attachment Model (GPA)

The model had large effects on the variation in each place attachment factor (Place Satisfaction, $R^2$ = .71; Social Bonding, $R^2$ = .75; Place Dependence, $R^2$ = .74; Place Identity, $R^2$ = .82). To assess the overall fit, I tested the model using different

indicators ($\chi^2$, *df*, $\chi^2/df$, *p*, CFI, IFI and TLI). Results indicated a good overall model fit. In table 4.6, I show the values of each indicator for each of the five models.

Table 4.6
Goodness of fit indicators for the five models

| Model | $\chi^2$ | *df* | $\chi^2/df$ | *P* | CFI | IFI | TLI | RMSEA |
|---|---|---|---|---|---|---|---|---|
| GPA | 369.37 | 222 | 1.66 | 0.000 | 0.88 | 0.89 | 0.85 | 0.07 |
| Place Identity | 67.63 | 42 | 1.61 | 0.007 | 0.94 | 0.94 | 0.90 | 0.07 |
| Place Dependence | 106.80 | 63 | 1.70 | 0.001 | 0.88 | 0.89 | 0.83 | 0.07 |
| Place Satisfaction | 41.70 | 33 | 1.26 | 0.142 | 0.966 | 0.969 | 0.943 | 0.043 |
| Social Bonding | 17.96 | 25 | 0.72 | .844 | 1.000 | 1.018 | 1.035 | 0.000 |

The Chi-square/*df* ratio falls under 2 indicating an acceptable fit (Arbuckle & Wothke, 1999). Marsh and Hocevar (1985) assert that the ratio of 2:1 to 5:1 indicates and acceptable fit. The CFI, GFI and TFI values are close, but not over 0.9, showing acceptable fit (Bentler, 1992, Bollen, 1989). Finally the Root-Mean-Square of Error Approximation (RMSEA) of 0.068 indicates an acceptable fit. RMSEA developed by Steiger (1990) assesses the discrepancy model and the data per degree of freedom for the model. There's an overall agreement on RMSEA guidelines: <.05 = good fit; .05 to.08 = acceptable fit; .08 to.10 = marginal fit; >.10 = poor fit (Browne & Cudeck, 1992).

*Place Identity Model*

This model focused on place identity and the relevant social and physical predictors. As *education* increased and *distance to special places* and *graffiti* decreased, place identity increased. Most of the predictors were directly related to place dependence, but as in the other models, *tenure* was indirectly related through *social ties* in the model.

The model (shown in Figure 4.3) has four exogenous variables (*education, closest distance to special place, graffiti*, and the latent variable *tenure*) and ten endogenous variables (the place identity factor, its four corresponding items, *length of residence*, *homeownership* and the latent variable *social ties* and its two corresponding variables *number of neighbors one knows by name* and *number of group memberships*). It explained more than 50 percent of variation in place identity.

Place Identity (PI) has four items (1, 12, 9, and 4). Arrows pointing to it from the left show that *graffiti*, *education*, *closest distance to special place* and *social ties* are related to it. *Graffiti* and *closest distance to special place* are negatively related, and *education* and *social ties* are positively related. This model captures the same effects as did PI in the GPA. Recall that in the GPA, *social ties* and *education*, were positively related and *closest distance to special place* and *graffiti* were negatively related to PI factor. Furthermore, *social ties* and *graffiti* had the strongest relationships. The same predictors with the same pattern of effect sizes emerged in the PI model.

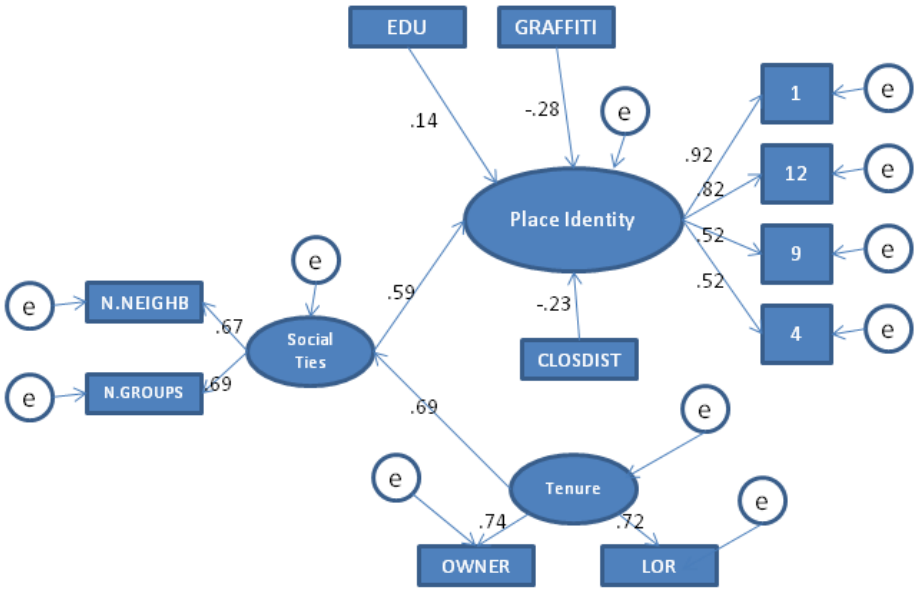



Figure 4.3 Place Identity model

To assess the overall fit, I tested the model using different indicators ($\chi^2$, *df*, $\chi^2$/ *df*, *p*, CFI, IFI, and TLI). The model exhibited a good overall fit. In table 4.6, I show the values of each one. The chi-square/*df* ratio falls under 2 indicating an acceptable fit (Arbuckle & Wothke, 1999). The CFI, IFI and TLI values are above 0.9, showing acceptable fit (Bentler, 1992; Bollen, 1989). Finally RMSEA of 0.066 indicates an acceptable fit.

### *Place Dependence Model*

This model focuses on place dependence and the relevant social and physical predictors. As *destinations* and *female respondents* increased and *distance to special places*, *graffiti* and *children under 18* decreased, place dependence increased. Most of the

predictors were directly related to place dependence, but as in the other models, *tenure* was positively, and indirectly, related through *social ties.* The model (shown in Figure 4.4) has seven exogenous (treeline *and on-street parking* (Trln-Onstpk), *closest distance to special place*, *graffiti*, *gender*, *children under 18* and *destinations)* and ten endogenous variables (the place dependence factor, its three corresponding items, *length of residence, homeownership, number of neighbors one knows by name, number of group memberships,* and the *latent variables social ties* and *tenure*). It explained more than 50 percent of variation in Place Dependence.

Place Dependence has three items (5, 2, and 7). Arrows pointing to it from the left show that *graffiti, destinations, gender, n.child* and *social ties* are related to it, with *graffiti, children under 18* and *gender* negatively related, and with *destinations* and *social ties* positively related. This model captures the same effects as PD did in the GPA.

Recall that in the GPA, *destinations* and *social ties also* were positively related and *graffiti also* was negatively related on PD (the social exogenous variables *children under 18* and *gender* were absent in the PD factor of GPA model). It also showed that s*ocial ties, graffiti* and *destinations* had the strongest relationships. Although the PD model has smaller numbers for those relationships, it support the relevance of those variables to Place Dependence.

I tested the overall fit of the model with seven indicators ($\chi^2$, *df*, $\chi^2/df$, *p*, CFI, IFI and TLI,). Results indicated a good overall fit. In Table 4.6, I show the values of each one. The ratio of chi-square/ *df* ratio falls under 2, indicating an acceptable fit (Arbuckle

& Wothke, 1999). The CFI, TFI and IFI values are close to 0.9, showing acceptable fit (Bentler, 1992, Bollen, 1989). However, value of TLI is below, but close to, 0.85 which is the cut off for an acceptable fit in relatively smaller sample size as the current study (Williams & Vaske, 2003). Finally RMSEA of 0.069 indicates an acceptable fit.

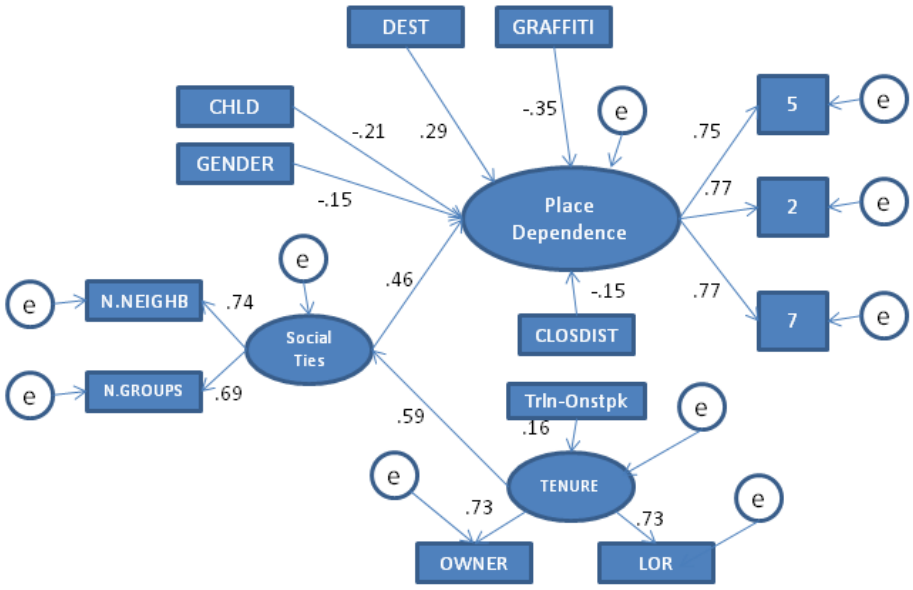



Figure 4.4 Place Dependence model

*Place Satisfaction Model*

This model solely focuses on place identity and the relevant social and physical attributes associated to it. As number of *churches* increased and *distance to special places* and *graffiti* decreased, place satisfaction increased. Most of the attributes were directly related to place satisfaction, but as in the other models, *tenure* was positively, and indirectly, related through *social ties*. The model (shown in Figure 4.5) has four

exogenous (*church, closest distance to special place, graffiti,* and the latent variable *tenure*), and nine endogenous variables (the place satisfaction factor, its three corresponding items, *length of residence, homeownership* and the latent variable *social ties* and its two corresponding variables *number of neighbors one knows by name* and *number of group memberships*). It explained about 39% percent of variation in Place Satisfaction.

Place Satisfaction has three items (3, 11, and 6). Arrows pointing to it show that it is associated to *social ties, graffiti, closest distance to special place,* and *church*. *Graffiti* and *closest distance to special place* were negatively related to Place Satisfaction, and *church* and *social ties* were positively related. This model captures the same effects as PS did in the GPA model. Recall that in the GPA model, as in the present model, *graffiti,* and *closest distance to special place* were negatively related to PS, and *church* and *social ties* were positively related to PS. However, the relative strength of the relationships differ, with graffiti having the strongest relationship in the PS model (though similar in size to its relationship in the GPA model) and *social ties* having the strongest relationship in the GPA model.

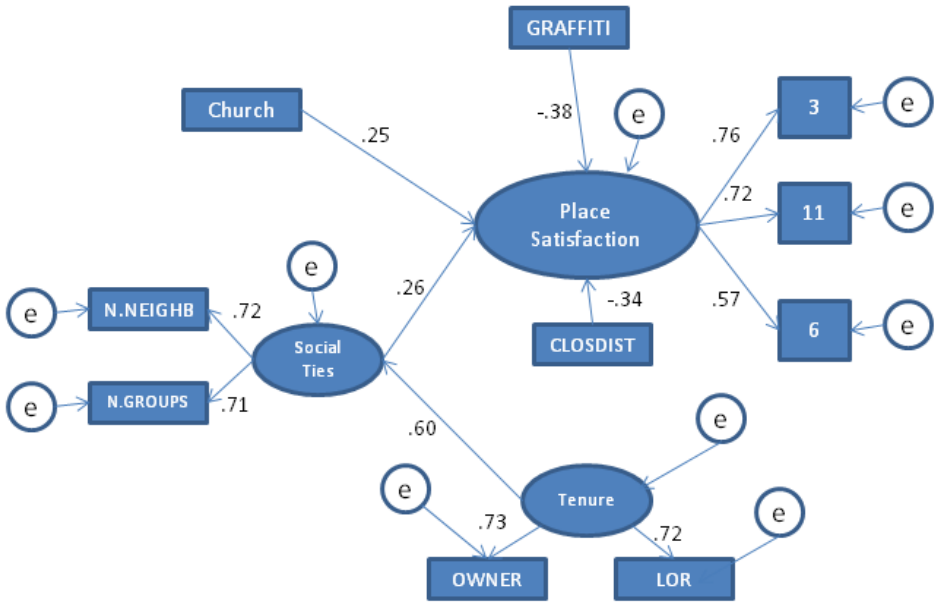



Figure 4.5 Place Satisfaction model

To assess the overall fit, I tested the model using different indicators ($\chi^2$, *df*, $\chi^2/df$, *p*, CFI, IFI, and TLI). Results indicated a good overall model fit. In Table 4.6, I show the values of these indicators. The Chi-square/*df* ratio falls under 2 indicating an acceptable fit (Arbuckle & Wothke, 1999). The CFI, IFI and TLI values are above 0.9, showing acceptable fit (Bentler, 1992; Bollen, 1989). Finally RMSEA of 0.043 indicates a great fit.

### *Social Bonding Model*

This model solely focuses on social bonding and the relevant social and physical attributes associated to it. As number of *churches* increased social bonding increased. Most of the predictors were directly related to Social Bonding. However, as in the rest of models, *tenure* exhibits is positively, and indirectly, related through *social ties* The model

(shown in Figure 4.6) has two exogenous (*church* and *age*) and ten endogenous variables (*social bonding* factor, its three corresponding items, *length of residence, homeownership, number of neighbors one knows by name, number of group memberships,* and the latent variables *social ties* and *tenure*). It explained about 93% of variation in Social Bonding.

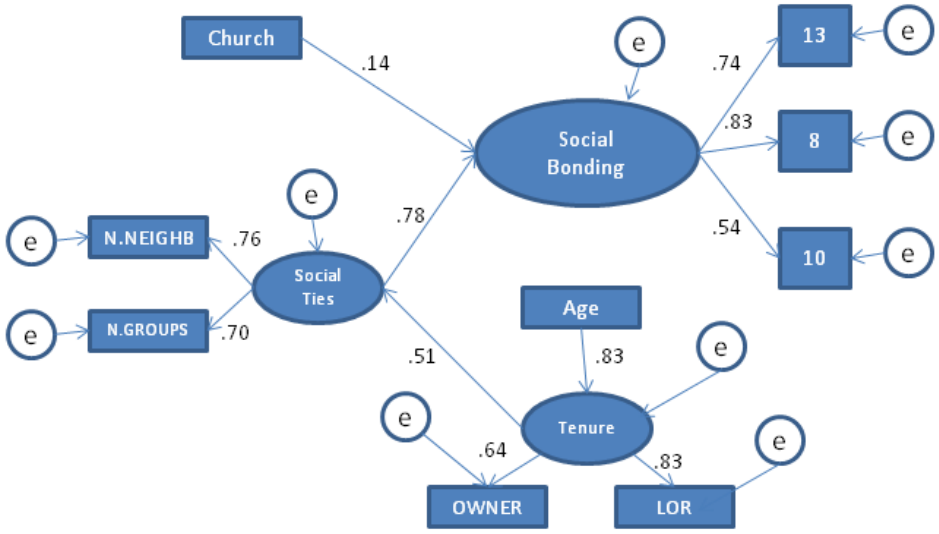



Figure 4.6 Social Bonding model

Social Bonding has three items (13, 8, and 10). Arrows pointing to it show that it is positively associated with *social ties* and *church*. This model captures almost the same relationships as SB did in the GPA model. Recall that in the GPA, *social ties* was also positively related to SB (however *church* was not). In each case, *social ties* had the strongest (and similar sized) relationships on Social Bonding, indicating its importance to Social Bonding.

To assess the overall fit, I tested the model using different indicators ($\chi^2$, *df*, $\chi^2/df$, *p*, CFI, IFI, and TLI). Results indicated a great overall fit. In Table 4.6, I show the values of these indicators. The chi-square/*df* ratio falls under 2 indicating an acceptable fit (Arbuckle, Wothke, 1999). The CFI, IFI and TLI values are above 0.9, showing acceptable fit. Finally RMSEA of 0.000 indicates a great fit.

In sum, all models exhibited acceptable to good fit. The social bonding model exhibited the best model fit, followed by place satisfaction. In the next section, I address the hypotheses in two parts. Part one assesses three hypothesis for the findings from the GPA. Part two assesses the same hypotheses for the four place attachment models: Place Identity, Place Dependence, Place Satisfaction, and Social Bonding. I break down the models to explore the effects of physical and social attributes separately. See Appendix J and K for the full table of predictors and effect sizes for different models.

## Part One: General Model of Place Attachment (GMPA)

### *Physical Attributes and the Place Attachment Factors*

General place attachment (GPA) model confirmed statistically significant direct relations of four physical attributes on place attachment. *Graffiti* and *closest distance to special places* reduced it, while *destinations* and *churches* increased it. *Graffiti* had the strongest relationship followed by *closest distance to special places*, *destinations* and then *church*. Variables *treelines flanking sidewalks*, and *on-street parking* did not exhibit any statistically significant relationships. This model assumed that *graffiti* is related to three of the place attachment factors (all except for social bonding) with strongest

relationship on place satisfaction. *Closest distance to special places* was related to place satisfaction and place identity (with stronger relation on place satisfaction). People who lived closer to their special places had higher levels of place satisfaction and place identity. A new variable, *destinations*, exhibited significant relationship in the model. This variable was calculated as the sum of variables *shop* and *eat* (shopping and eating places). *Destinations* was only related to the place dependence factor. In Tables 4.7 and 4.8, I show the list of physical attributes, their significant direct effects and total effects sizes on GPA.

Table 4.7
The direct effects and significance levels of each physical attribute in the GPA

| Relationship | *Estimate* | *S.E.* | *p* |
|---|---|---|---|
| Place Satisfaction← Graffiti | -.32 | .01 | .001 |
| Place Identity ← Graffiti | -.19 | .01 | .002 |
| Place Dependence ← Graffiti | -.34 | .01 | .001 |
| Place Dependence ← Destinations | .22 | .02 | .001 |
| Place Satisfaction ← Church | .19 | .01 | .010 |
| Place Satisfaction ← CLOSDIST | -.13 | .01 | .010 |
| Place Identity ← CLOSDIST | -.25 | .01 | .002 |

Table 4.8
Total effects sizes of each physical attribute in the GPA

| | Church | Destinations | Graffiti | CLOSDIST |
|---|---|---|---|---|
| Place Identity | .00 | .00 | -.19 | -.13 |
| Place Dependence | .00 | .22 | -.34 | .00 |
| Social Bonding | .00 | .00 | .00 | .00 |
| Place Satisfaction | .19 | .00 | -.31 | -.25 |

*Social Attributes and the Place Attachment Factors*

GPA model confirmed positive associations with the social attributes *education, number of neighbors one knows by name, number of group memberships, homeownership, length of residence,* and *age*. This model assumed that the latent social variables *social ties* and *tenure* were positively related to all four attachment factors. The former was positively, and indirectly, related through the latter on each place attachment factor. *Social ties* showed the strongest relationships on all four place attachment factors followed by *tenure*, *age* and *education*. In Tables 4.9 and 4.10, I show the social attributes, their significant effects and total effects sizes on GPA.

Table 4.9
The direct effects and significant levels of each social attribute in the GPA

| Relationship | *Estimate* | *S.E.* | *p* |
|---|---|---|---|
| Place Satisfaction← Social Ties | .72 | .21 | .001 |
| Place Identity ← Social Ties | .86 | .25 | .001 |
| Place Dependence ← Social Ties | .76 | .22 | .001 |
| Social Bonding ← Social Ties | .87 | .23 | .001 |
| Place Identity ← Education | .16 | .12 | .005 |

Table 4.10
The effects sizes of each social attribute in GMA

| | Age | Tenure | Education | Social Ties |
|---|---|---|---|---|
| Place Identity | 0.36 | 0.43 | 0.12 | 0.86 |
| Place Dependence | 0.38 | 0.37 | 0.00 | 0.76 |
| Social Bonding | 0.35 | 0.42 | 0.00 | 0.87 |
| Place Satisfaction | 0.29 | 0.34 | 0.00 | 0.71 |

See Appendix H for the full list of predictors and their significant levels.

## Part Two: The Four Place Attachment Models: Place Identity, Place Dependence, Place Satisfaction and Social Bonding

*Physical Attributes and the Four Place Attachment Models*

The four models showed significant direct relationships of physical attributes *graffiti*, *closest distance to the special place*, *destinations*, and *church*. The variables *treelines flanking sidewalks,* and *on-street parking* were not relevant in any of the models. In agreement with the results from GPA model, *graffiti* was negatively related to three of the place attachment models. It was not related to the social bonding model. *Graffiti* had the strongest relationship in place satisfaction model followed by its relationships in the place dependence and place identity models. *Closest distance to special place* was relevant in three models (all but the social bonding model). The variable *destinations* was only relevant in the place dependence model, and *church* was relevant in the place satisfaction model. These results agrees with the findings in the GPA model.[6] In Tables 4.11 and 4.12, I show the list of physical attributes, their significant effects and total effects sizes in different models.

Table 4.11
The direct effects and significant levels of each physical attribute in different models

| Relationship | *Estimate* | *S.E.* | *p* |
|---|---|---|---|
| Place Satisfaction← Graffiti | -.38 | .01 | .001 |
| Place Identity ← Graffiti | -.28 | .01 | .001 |
| Place Dependence ← Graffiti | -.35 | .01 | .001 |
| Place Satisfaction ← CLOSDIST | -.34 | .00 | .001 |
| Place Identity ← CLOSDIST | -.23 | .00 | .002 |
| Place Dependence ← CLOSDIST | -.15 | .00 | .004 |
| Place Dependence← Destinations | .29 | .02 | .001 |
| Place Satisfaction ← Church | .25 | .02 | .004 |

[6] The variable *Church* exhibits an effect in the social bonding model at the 90% level.

Table 4.12
The total effects sizes of each physical attribute in various models

| | Graffiti | Destinations | Church | CLOSDIST |
|---|---|---|---|---|
| Place Identity | -0.27 | _ | _ | -.27 |
| Place Dependence | -0.35 | 0.29 | _ | -.15 |
| Social Bonding | _ | _ | _ | - |
| Place Satisfaction | -0.38 | _ | 0.25 | -.34 |

*Social Attributes and the Four Place Attachment Models*

The four models showed direct and indirect associations with the social attributes *children under 18, gender, education, number of neighbors one knows by name, number of group memberships, homeownership, length of residence* and *age*. All models showed positive associations with the latent social variables *social ties* and *tenure*. In agreement with the pattern previously shown in the GPA model, the latter variable was related to dependent variables in all models indirectly and through the former. *Social ties* had the strongest relationships in all four place attachment models followed by *tenure, age, children, gender* and *education*. This agrees in part with the results yielded from the GPA model. However, *Children under 18* and *gender* did not show relationships in that model. The variables *children under 18, gender* and *education* each appear in only one of the four models, unlike *social ties* and *tenure* which appear in all models. *Children under 18* and *gender* are related to place dependence, while *education* significantly are related to place identity. In Tables 4.13 and 4.14, I show the list of social attributes, their significant effects and total effects sizes in different models.

Table 4.13
The direct effects and significant levels of each social attribute in different models

| Relationship | *Estimate* | *S.E.* | *p* |
|---|---|---|---|
| Place Satisfaction← Social Ties | .26 | .13 | .015 |
| Place Identity ← Social Ties | .59 | .17 | .001 |
| Place Dependence ← Social Ties | .46 | .15 | .001 |
| Social Bonding ← Social Ties | .78 | .14 | .001 |
| Place Identity ← Education | .14 | .16 | .046 |
| Place Dependence ← Children Under 18 | -.21 | .09 | .006 |
| Place Dependence ← Gender | -.15 | .13 | .047 |

Table 4.14
The effects sizes of each social attribute in various models

| | Social Ties | Tenure | Children under 18 | Gender | Education | Age |
|---|---|---|---|---|---|---|
| Place Identity | 0.60 | 0.42 | _ | _ | 0.14 | |
| Place Dependence | 0.46 | 0.27 | -0.21 | -0.15 | _ | |
| Social Bonding | 0.78 | 0.39 | _ | _ | _ | 0.33 |
| Place Satisfaction | 0.26 | 0.15 | _ | _ | _ | _ |

The comparison analyses revealed that the results obtained from the GPA model are coherent to results obtained from the four subsequent models: Place Identity, Place Dependence, Place Satisfaction and Social Bonding. While the physical variables used in the two sections are identical, the four models revealed more significant social attributes than the GPA model.

### Spatial Clustering of the Place attachment Item ("I am attached to my neighborhood")

The place attachment item showed spatial clustering. To visualize the spatial characteristic of this item, I grouped the 143 surveys in two ways. First, I grouped the place attachment item for the residents at the amended city block level unit (place attachment values averaged per block to create aerial data) (Figure 4.7). The Moran's I for the place attachment item showed a clustering pattern in place attachment values using area data ($I$ = 0.21, $p$ =.001).

Second, I mapped the place attachment values at their respondents point locations (Figure 4.8). The Moran's I for the point data also showed clustering ($I$ = 0.24, $p$ =.001). These results mean that residents who live closer to each other have more similar values of place attachment.

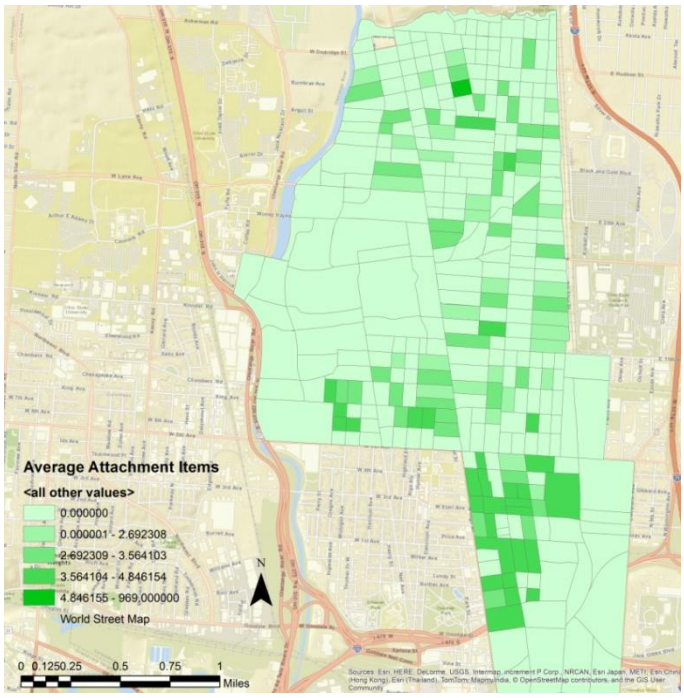



Figure 4.7 Areal distribution of place attachment item in the studied area

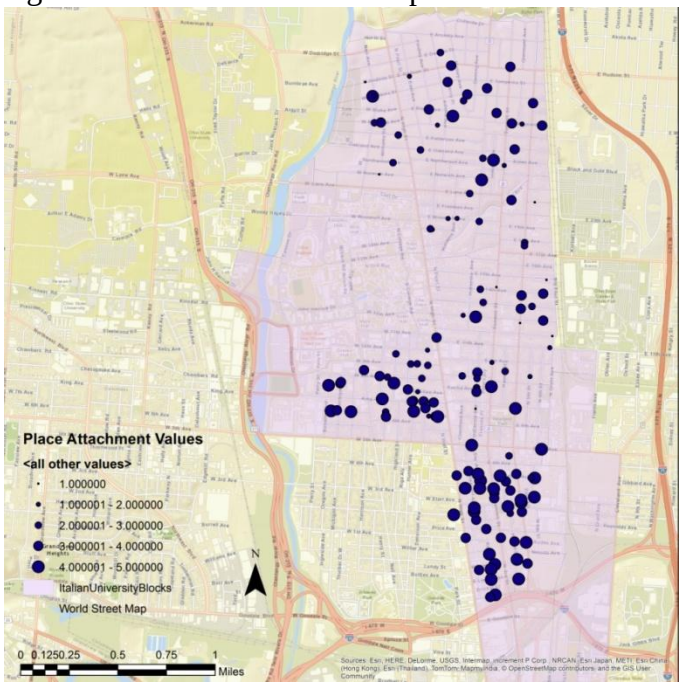



Figure 4.8 Point distribution of place attachment item in the studies area

**Spatial Clustering of Underlying Factors in the Place Attachment**

All four factors of place attachment displayed spatial clustering. To visualize the spatial characteristic, I mapped the place attachment factors at their respondents point locations. In Figures 4.9 to 4.12, I display the distribution of place attachment factors in the study area. The Moran I's showed that each component of place attachment displayed spatial clustering (place identity, $I$ = 0.30, $p$ =.001; place dependence, $I$ = 0.40, $p$ =.001; place satisfaction, $I$ = 0.27, $p$ =.002; social bonding $I$ = 0.16, $p$ =.002). Place dependence showed the strongest clustering distribution amongst the four place attachment factors and social bonding showed the weakest.

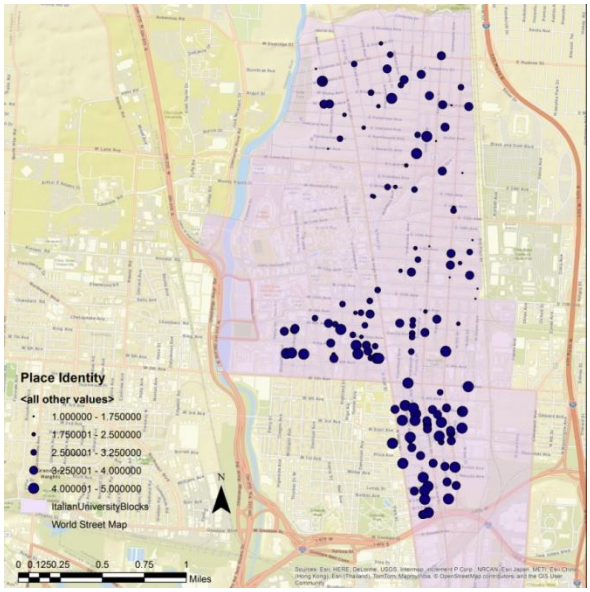



Figure 4.9 Spatial distribution of *place identity* factor in the sample

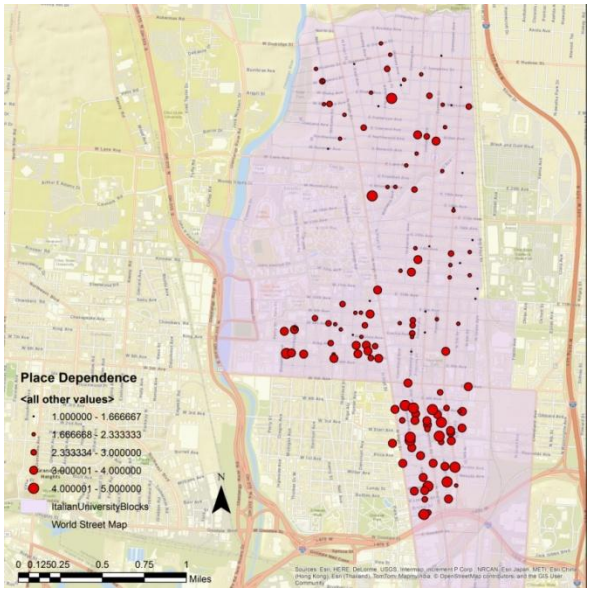



Figure 4.10 Spatial distribution of *place dependence* factor in the sample

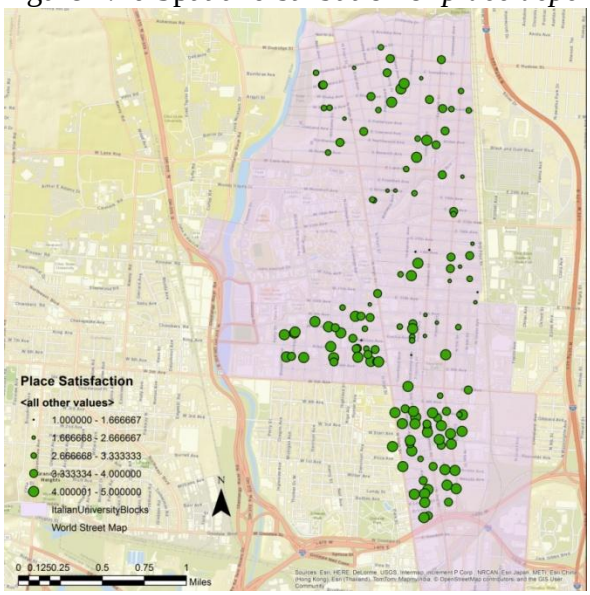



Figure 4.11 Spatial distribution of *Place Satisfaction* factor in the sample

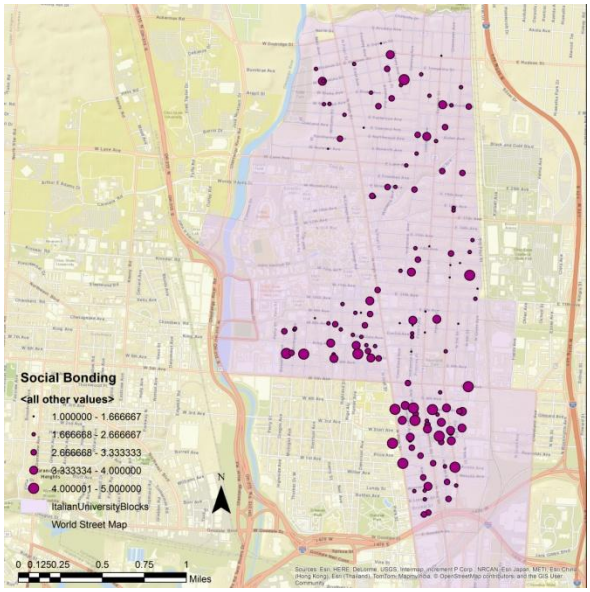



Figure 4.12 Spatial distribution of *Social Bonding* factor in the sample

# CONCLUSION

The dissertation tried to answer five questions: 1) Is place attachment a multi-factoral construct comprised of place identity, place dependence, place satisfaction and social bonding? 2) Are place attachment factors only associated to physical attributes? 3) Are place attachment factors only associated to social attributes? 4) Does place attachment reveal spatial clustering? 5) Do the underlying factor of place attachment show spatial clustering? Prior to discussing the findings, I should note that the present study had some sampling and statistical problems, which I discuss later, that may limit inferences drawn from the results.

The results confirmed the multidimensional nature of place attachment. These results rule out studies that found a one-dimensional construct of place attachment (Jorgensen & Stedman, 2001; Kaltenborn & Bjerke, 2002). Agreeing with the other studies, the current study found place identity and place dependence as distinctive factors of place attachment (Halpenny, 2010; Hwang et al, 2005; White et al, 2007; Williams & Vaske, 2003). However, the current study found a four-dimensional model comprised of place identity, place dependence, place satisfaction and social bonding. Urban environments may cause more complex emotional and cognitive responses which may, in turn, lead to a multi-dimensional construct of place attachment. This finding is similar to the initial assumption of Kaltenborn and Bjerke (2002), with a difference of adding the fourth factor, *social bonding*. In a way, the current study combines the results of Kyle et

al (2005) and Kaltenborn and Bjerke (2002). The former found three dimensions of place identity, place dependence and social bonding, and the latter had place satisfaction instead of social bonding. The current study contemplated a comprehensive set of items relating to identity, social bonds, functional attachment and physical satisfaction. Results indicated a multidimensional construct that discriminated for each of the four concepts. Furthermore, with one minor exception, the confirmatory factor analysis found that the indicator items of each factor worked well and as expected. It showed a reliable four set of items for place identity, and reliable three set of items for each of place dependence, place satisfaction and social bonding. Research could test whether these scales emerge in other places and apply them to test various components of place attachment.

The structural equation models (SEM) revealed several physical and social attributes related to place attachment. This agrees with previous research finding that physical (or perceived) and social attributes are related to place attachment (Stedman, 2003; Bonaiuto et al, 1999). The present study differed from earlier research in that it included physical attributes. Social ties were related to all the models and factors in the general place attachment model (GPA). Amongst the physical attributes, graffiti was the most influential, relating to three of the models: place identity, place dependence, and place satisfaction.

The latent variable *social ties*, obtained from the social variables *number of neighbors one knows by name* and *number of voluntary group memberships*, exhibited the strongest and most prevalent relationships among all variables (Comstock et al, 2010; Lewicka, 2011; Mesh & Manor, 1998; Sampson, 1988; Soini et al, 2012). It was

positively related to each of the attachment factors and revealed strongest relationships in each model. This confirms the previous literature that found, residents with higher levels of locally based relationships and social activities show larger values of place attachment (Mesch & Manor, 1998).

I expected to obtain larger effects from social compared to physical attributes for two reasons. Studies have found large effects of social attributes on place attachment (Arnberger & Eder, 2012; Brown & Raymond 2007; Clark & Stein, 2003; Comstock et al, 2010; Sampson, 1988; Stedman et al, 2010; Trentelman, 2011). Although some of those studies did not consider physical attributes, the similarity of the social attributes (for example social ties) to place attachment makes it more likely that these attributes have stronger relationships on it. Second, my study area exhibited homogeneity of physical attributes. Most of the physical attributes did not have normal distribution. Thus one would not expect large effects related to these attributes.

Graffiti, a disorder or poor upkeep variable, was negatively related to three factors of place attachment: place dependence, place satisfaction and place identity. Results showed that graffiti exhibited the strongest relationship with place dependence, followed by place satisfaction and place identity. This makes sense, because the former two factors have more of a physical root than place identity. As graffiti decreased each of the three factors of place attachment increased. The findings of negative effects of graffiti agree with research on the negative effects of semi-fixed and movable incivilities (such as graffiti) on place attachment and place satisfaction (Brown, 2003; Brown, Perkins, & Brown, 2004; LaGrange, Ferraro, & Supancic, 1992; Spelman, 2004) and to reduced

preference and physical activity associated with graffiti (Ellaway, Macintyre, & Bonnefoy, 2005; Handy et al, 2002). In contrast to research finding negative effects of fixed features of incivilities such as vacant houses and dilapidated buildings (Accordino & Johnson, 2000; Brown et al, 2004; Hur, 2010) the current study did not find any such effects. I studied the direct effect of dilapidated buildings on the underlying factors of place attachment. However, the other studies focused on its effects on perception and preference. Future research can focus on indirect effects of dilapidated buildings, through the perception of presence of dilapidated buildings, on place attachment. Also, future research can focus on the effects of moveable types of disorder, such as presence of litter, sidewalk condition and broken features,

Destinations (prevalence of shops and eating places per area) improved place dependence in the place dependence model and in the GPA model. As the number of shops and eating areas in each perceived neighborhood increased, place dependence increased. This result fits the definition of place dependence as the functional dimension of place; and it supports the positive effect of presence of pubs, shops and coffee shops on development of emotional bonds with neighborhoods (Alexander, Ishikawa, & Silverstein, 1977) or of local shopping areas in walkable distance (Lund, 2002; Plas & Lewis, 1996). Thus, it made sense that destinations was related to place dependence. Place dependence is the functional dimension of place attachment and it is assesses how the presence of amenities satisfies one's goals. In non-urban settings, it is associated with wilderness and recreational areas. In urban settings, it is associated with parks, restaurants, walkable areas, school system, and presence of work.

As the *closest distance to special areas* (marked on maps by residents) increased, place satisfaction, place identity and place dependence decreased. These relationships were almost consistent across the GPA and four place attachment models (this attribute was not related to place dependence in GPA model). In the present study, the closest distance to special place had stronger relationship to place identity and place satisfaction than on place dependence. The finding agrees with the finding that distance to the central activity building predicts place attachment (Sugihara & Evans, 2000), that shorter perceived walking distance from homes to public spaces strengthened place attachment (Francis et al, 2012; Plas & Lewis, 1996; Talen, 2000), and that the presence of local shopping areas in walkable distance strengthened place attachment (Lund, 2002; Plas & Lewis, 1996).In sum, the current findings specify that the distance to a special place is negatively related to the place-based factors of place attachment and not to the social based factor, social bonding. People may find their socially-valued places in areas farther away. However, this is not the case for physically-valued places.

The present study found a positive relationship of churches in place satisfaction model and the place satisfaction factor of GPA model. Churches were also relevant in the social bonding model. They represent third places, which may serve as a hub for gathering and bonding (Putnam, 2001). Different kinds of neighborhoods might have different kind of setting for social bonding, such as a local coffee shop where people gather[7]. Research can look at churches and other such local gathering places in different

[7] This is different than the number of shops and eating places in that it refers to some kind of setting where residents regularly gather and get to know one another as they might in a church

kinds of the neighborhoods to see if social bonding relates to them. Churches exhibit relationship to place satisfaction, which is somewhat unexpected. However, this relationship is weak. It is a weaker relationship than social ties and graffiti. Given the inconsistent finding, future research might look at the role of churches and other social gathering places on place satisfaction.

The results indicated that *tenure* was positively, and indirectly, related to all place attachment factors. Tenure was a latent social variable retained from *length of residence* and *homeownership.* This agrees with the studies that found relevance of length of residence (Arnberger & Eder, 2012; Brown & Raymond 2007; Clark & Stein, 2003; Comstock et al, 2010; Sampson, 1988; Stedman et al, 2010; Trentelman, 2011) and homeownership (Eisenhauer et al, 2000; Lund, 2002; Mesch & Manor, 1998; Wood et al, 2010). Length of residence is the most prominent social attribute in the literature. Time translates into familiarity and familiarity translates into preference and attachment. Studies have confirmed the association between familiarity and preference and/or positive affect (Imamoglu, 2000; Kaplan, 1987; Nasar, 1980; Pedersen, 1978; Purcell, 1992; Van den Berg, Vlek, & Coeterier, 1998; Zajonc, 1968). The mere repeated exposure to a stimulus enhances an individual's positive affect toward it (Zajonc, 1968). Homeownership also predicts place attachment. Limited liability explains how economic investments (e.g. home ownership) facilitate social relationships and place attachment eventually. The present study combined the two attributes into a latent variable, tenure. Tenure was indirectly related to all place attachment factors, through the latent variable *social ties*. Mesch and Manor (1998) found indirect effects of one a tenure variable

(homeownership) on place attachment. The present study, which used a more robust measure of tenure including the two items homeownership and length of residence, also found indirect relationships on the four factors of place attachment.

Four social attributes that others have studied appeared in fewer models and affected fewer aspects of place attachment. *Age* was positively, and indirectly, relevant in two models: the GPA and social bonding model. In both models, it was indirectly related through tenure. A study of rural setting found that adults had significantly higher levels of sense of community than adolescents. (Pretty, Chipuer, & Bramston, 2003). The study differs from my study in two ways: it studied a rural setting and used only two levels of age: adults and adolescents. Adults owned their home and lived longer in the studied setting. However, the study did not control for homeownership and length of residence. Scannell and Gifford (2010) also found positive effect of age on civic place attachment. Their study differed in scale in that they contemplated attachment at the city level. It's worth noting that the older residents tended to live longer at their residences. The study controlled for length of residence. However, it did not control for the homeownership. In the current study also, older residents had longer length of residence and owned their place (One neighborhood had a large, young, student population who rented their place). My model incorporated both length of residence and homeownership in the model. Thus, in a way, I assessed the relationship of one, controlling for the other. E*ducation level* showed positive relationship to one factor of place attachment -- place identity -- in the GPA model and the place identity model. Some studies found positive effects for education (Scannell & Gifford, 2010), but others found negative effects (Bonaiuto et al,

1999; Fried, 1984; Krannich & Greider, 1984; Lewicka, 2005) and no effect (Scannell & Gifford, 2010). Perhaps it depends on the type of attachment. Lewicka (2011) argues that everyday attachment (attachment to neighborhood) is positively associated with age and negatively associated with education. However, civic attachment (attachment to the city) is positively associated with education. I believe that education exposes people to larger network of people and places, while it increases cosmopolitan concerns. Thus, transfers attachment from locally based to more civic based. Others found that education and age are associated with environmental concern (Dunlap, Van Liere, & Dillman, 1979).

*Gender* showed small, negative relationship in the place dependence model only. Men had weaker levels of place dependence. In other words, women maybe more linked to local facilities than men. Place dependence may take on more importance to women than do other aspects of place attachment. Women prefer places that support necessary activities and offer easy physical access, especially when accompanied by children (Frank & Paxton, 1989). Pretty et al (2003) found that women base their attachment on social engagement, were men base it on local activities. This might infer that men, in urban settings, cannot fully realize their activity-based needs and women can. Another study found that women have higher levels of place attachment at various levels (home, neighborhood and city) (Hidalgo & Hernandez, 2001). However, place attachment showed small association to gender in the current study. This partly agrees with Scannell and Gifford (2010) who found no effect of gender on place attachment.

Place attachment and each of the four place attachment factors showed spatial clustering. Residents who live closer to each other reported similar levels in place

identity, place dependence, place satisfaction and social bonding. Clustering distributions means that the physical dimension of space may be a related to place attachment. This does not necessarily mean that physical attributes are the major/only predictor of place attachment as people who live in close distance will have higher similarities in income, race, education levels and etc. Complementary analyses such as regressions, controlling for social attributes, could further explore the importance of physical space in place attachment. Spatial distribution could be a starting point in studying physical attributes. The results of autocorrelations indicated that social bonding had the weakest clustering and place dependence had the strongest. This goes hand in hand with the earlier finding that people may find their socially-valued places in areas farther away, but this is not the case for physically-valued places. In sum, out of the four factors of place attachment, the three physically-oriented factors (place dependence, place satisfaction and place identity) are more rooted in the local place but social bonding shows less, but still significant, associations with the local place. The current study solely focused on the univariate autocorrelation of the place attachment factors. Future research can focus on performing spatial distribution analysis on larger areas. Also, it may consider the spatial association between physical and social attributes and place attachment factors (performing various types of spatial regression may be helpful in realizing the physical and social attributes which are spatially related to place attachment factors).

This study aimed at improving external validity by choosing a sample which varied in both social and, to some extent, physical attributes. This was done in order to create a setting that may be representative of urban areas. Also, paper surveys were used

instead of online surveys. This was done to eliminate the lack of internet access as a deciding factor in survey response. However, the use of mailed paper surveys resulted in a low overall response rate and a selective sample; those who responded may not represent the population residents. Perhaps, residents who responded had higher levels of place attachment, or rootedness, than those who did not respond. Also, the two selected neighborhoods had similar physical characteristics. Thus, they showed non-normal distribution in many physical attributes. This unrealistic sample would affect generalizability of the results over both different areas and different populations. The findings also have limits in generalizability over time. The present study reported a snap-shot in time. Research could compare place attachment over time (Devine-Wright; 2013). Researchers could also test the generality of the present findings to other neighborhoods and populations in and outside Ohio and the U.S.

The current study tried to improve internal validity by randomizing the order of items and including both positive and negative items. Still, reactivity may threaten internal validity. The multiple responses may make people aware (consciously or not) of what is being tested and this awareness might have affected their responses. To overcome this problem, future research might consider supplementing verbal measures with unobtrusive measures of behavior aimed at assessing place identity, place dependence, place satisfaction, and social bonding.

Also the use of virtual auditing may have caused some limitations. First, the images are taken in specific times of the year, eliminating snow or rain, making it less realistic for cities experiencing long winters. Second, the images lack temporal aspect

meaning the images are captured around one year ago (Google shows the month and year of the captured images in the Street-View mode on the bottom right of the screen).

Finally, as a correlational study, the present research cannot establish cause. Research could seek better samples, obtain measures of behavior or verbal measures, and get at cause by measuring responses to controlled manipulations of photos of places. In particular, studies could manipulate physical attributes associated with place attachment in the present study, such as walkability, greenery, public spaces, shops and restaurants, and graffiti.

Future research could test the reliability of the measures and, in the form of a quasi-experiment, as conditions change in one area but not in others, it can test for effects of those changes on place attachment. They could partition the data to examine the predictive accuracy from one or more part based on the results obtained from another part. They could also compare statistical models in different samples of varying locations (Kendzierski & Morganstein, 2009; Lahaye, Luminet, Van, Bodart &Mikolajczak, 2010). For example, researchers used confirmatory factor analysis to examine, and compare, the factor structure of a questionnaire in three European countries (Lahaye, et al, 2010). Other researchers cross validated the SEM of physical activity self-definition model, obtained from a sample of 622 runners, on a sample of 397 cyclists (Kendzierski & Morganstein, 2009).

Understanding the effects of physical attributes can help planners and urban designers to create desirable places. For example, if the present findings on graffiti and special places (shops, eating places and churches) hold, communities could increase

maintenance efforts and encourage mix of uses that include shops, eating places and churches. In spite of limitations of the current study, one variable, graffiti has enough support to consider for urban planning and urban design. Graffiti is an upkeep, incivility or disorder variable and of studies finding that find poor upkeep, physical incivilities or disorder reducing preference, neighborhood satisfaction, and physical activity (Accordino & Johnson, 2000; Brown, 2003; Brown et al 2004; Ellaway, Macintyre, & Bonnefoy; Handy et al, 2002; LaGrange et al, 1992). As these variables relate to place attachment, preferences and physical activity, it seems likely that lessening physical disorder (such as graffiti) through better maintenance and through clean-up fix up campaigns might well improve place attachment. Research could study factors, such as presence of shops, eating places, parks, natural trails, walkable areas and interesting architecture. These are the factors which majority of people in the present study cited as *special* places. New urbanist theory points to these places as public spaces and posits that integrating the public spaces with residential areas and careful design of public spaces can enhance sense of community and place attachment (Talen, 2000). The current study supports the validity of these suggestions. Thus, planners may design public spaces with regards to quantity and spatial prevalence (for better accessibility). The present study found that the linear distance to special places is a predictive of place attachment. However, linear distance doesn't quite capture the real distance that residents have to walk or drive and rather the walking/driving needs to be studied for more exact conclusions.

Recall that for urban design, we seek consensus among the large number of people who experience a place to understand the kinds of physical features a place should

have. Depending on the level of design, the relevant level examined for the consensus varies. For a city, one might seek a consensus among residents and visitors to the city; for a neighborhood, one might seek consensus among residents of that neighborhood. For place attachment, there may be common principles of design that apply across different levels, and there may be distinct principles that apply to a specific context. To improve place attachment and the related quality of life for residents, urban designers need a better knowledge base on the areas of agreement and disagreement for what physical features affect place attachment.

Successful urban policies are place based. Thus, policymakers need to make distinction between various urban settings. Brower (1996) distinguishes four different urban neighborhoods. 1) Part of the city with lots to do with mix of many different people and uses; 2) part of a city that has a feeling of small town; 3) a separate residential area and 4) part of the city where people feel isolated. The current study focused the first type of neighborhoods. Italian Village and University area are both urban core neighborhoods with a variety of uses and residents with varying socioeconomic backgrounds. Brower (1996) refers to these neighborhoods as centers. Residents in such neighborhoods seek improvements which makes the neighborhood more or less like a center. Place attachment research cannot be the sole director of urban design policy making. However, the results of the current study agree with the findings Brower (1996) and a number of studies in preferences and active living (Alexander, Ishikawa & Silverstein, 1977; Francis, Wood, Nuiman, & Giles-Corti, 2012; Kweon, Sullivan, & Wiley, 1998; Lund, 2002; Talen, 2000). In sum, at the neighborhood level, especially center neighborhoods,

policies may encourage mix of uses, implementing eating and shopping places accessible to the residents. They may also encourage local programs that encourage neighborhood clean-up and upkeep programs.

REFRENCES

Accordino, J. & G. T. Johnson (2000). Addressing the vacant and abandoned property problem. *Journal of Urban Affairs, 22* 301-315.

Adriaanse, C. C. M. (2007). Measuring residential satisfaction: A residential environmental satisfaction scale (RESS). *Journal of Housing and the Built Environment, 22,* 287-304.

Albright, J. J. (2006). Confirmatory factor analysis using AMOS, LISREL, and MPLUS. The Trustees of Indiana University. USA. Available at: http://www. iub. edu/~ statmath/stat/all/cfa/cfa2008. pdf.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A pattern language: Towns, buildings, construction (Vol. 2).* Oxford: Oxford University Press.

Amérigo, M. A. & J. I. Aragones (1997). A theoretical and methodological approach to the study of residential satisfaction. *Journal of Environmental Psychology, 17,* 47-57.

Amsden, B. L., Stedman, R. C., & Kruger, L. E. (2010). The creation and maintenance of sense of place in a tourism-dependent community. *Leisure Sciences, 33,* 32-51.

Anderson, J. C. & D. W. Gerbing (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin 103,* 411.

Anselin, L. & Rey, S. J. (2010). *Perspectives on spatial data analysis* (pp. 1-20). Springer Berlin Heidelberg.

Anselin, L., Syabri, I., & Kho, Y. (2006). GeoDa: an introduction to spatial data analysis. *Geographical Analysis*, *38,* 5-22.

Arbuckle, J. (1999). Amos 4.0 user's guide. Chicago: SmallWaters Corporation.

Arnberger, A. & Eder, R. (2012). The influence of green space on community attachment of urban and suburban residents. *Urban Forestry & Urban Greening*, *11*, 41-49.

Badland, H. M., Opt, S., Witten, K., Kearns, R. A., & Mavoa, S. (2010). Can virtual streetscape audits reliably replace physical streetscape audits? *Journal of Urban Health*, *87*, 1007-1016.

Baron, R. M. & D. A. Kenny (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology 51*, 1173.

Beckley, T. M., Stedman, R. C., Wallace, S. M., & Ambard, M. (2007). Snapshots of what matters most: Using resident-employed photography to articulate attachment to place. *Society & Natural Resources, 20*, 913-929.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin 107*, 238-246.

Bentler, P. M. (1992). On the fit of models to covariances and methodology to the Bulletin. *Psychological Bulletin 112*, 400.

Boarnet, M. G., Forsyth, A., Day, K., & Oakes, J. M. (2011). The street level built environment and physical activity and walking: results of a predictive validity study for the Irvine Minnesota Inventory. *Environment and Behavior 43*, 735-775.

Bollen, K. & R. Lennox (1991). Conventional wisdom on measurement: A structural equation perspective. *Psychological Bulletin 110*, 305.

Bollen, K. A. (1989). Structural equations with latent variables. New York, Wiley.

Bollen, K. A. (1990). Overall fit in covariance structure models: Two types of sample size effects. *Psychological Bulletin 107,* 256.

Bonaiuto, M., Aiello, A., Perugini, M., Bonnes, M., & Ercolani, A. P. (1999). Multidimensional perception of residential environment quality and neighborhood attachment in the urban environment. *Journal of Environmental Psychology*, *19,* 331-352.

Boomsma, A. (1983). *On the robustness of LISREL (maximum likelihood estimation) against small sample size and non-normality* (Doctoral dissertation, University of Groningen).

Bricker, K. S. & D. L. Kerstetter (2000). Level of specialization and place attachment: An exploratory study of whitewater recreationists. *Leisure Sciences 22*, 233-257.

Brower, S., & Taylor, R. B. (1997). Qualities of Ideal and Real-World Neighborhoods. In M. Gray (Ed.) *Evolving environmental ideals: Changing ways of life, values, and design practices* (pp. 99-106). Stockholm: Kungl Tekniska Hogskolan.

Brown, B. B., Perkins, D. D., & Brown, G. (2004). Incivilities, place attachment and crime: Block and individual effects. *Journal of Environmental Psychology, 24*, 359-371.

Brown, G. (2006). Mapping landscape values and development preferences: a method for tourism and residential development planning. *International Journal of Tourism Research 8*, 101-113.

Brown, B. B. & Perkins, D. D. (1992). Disruptions in place attachment. In I. Altman & S. Low (Eds.) *Place Attachment* (pp. 279-304). New York: Plenum.

Brown, B., Perkins, D. D. & Brown, G. (2003). Place attachment in a revitalizing neighborhood: Individual and block levels of analysis. *Journal of Environmental Psychology, 23,* 259-271.

Brown, G. & Raymond, C. (2007). The relationship between place attachment and landscape values: Toward mapping place attachment. *Applied Geography, 27,* 89-111.

Brown, B. B. & Werner, C. M. (1985). Social cohesiveness, territoriality, and holiday decorations the influence of Cul-De-Sacs. *Environment and Behavior, 17,* 539-565.

Browne, M. W. & Cudeck, R. (1993). Alternative ways of assessing model fit. *Sage Focus Editions, 154,* 136-136.

Bruin, M. J. & Cook, C. C. (1997). Understanding constraints and residential satisfaction among low-income single-parent families. *Environment and Behavior, 29,* 532-553.

Baruch, Y. & Holtom, B. (January 01, 2008). Survey response rate levels and trends in organizational research. *Human Relations, 61,* 1139-1160.

Byrne, B. M., Shavelson, R. J., & Muthén, B. (1989). Testing for the equivalence of factor covariance and mean structures: The issue of partial measurement invariance. *Psychological Bulletin, 105,* 456.

Caughy, M. O., O'Campo, P. J., & Patterson, J. (2001). A brief observational measure for urban neighborhoods. *Health & Place, 7,* 225-236.

Chamlee-Wright, E. & Storr, V. H. (2009). There's no place like New Orleans: Sense of place and community recovery in the Ninth Ward after Hurricane Katrina. *Journal of Urban Affairs, 31,* 615-634.

Churchman, A. & Mitrani, M. (1997). The role of the physical environment in culture shock. *Environment and Behavior, 29,* 64-86.

Clark, W. A. & Ledwith, V. (2006). Mobility, housing stress, and neighborhood contexts: evidence from Los Angeles. *Environment and Planning A*, *38*, 1077.

Clark, J. K. & Stein, T. V. (2003). Incorporating the natural landscape within an assessment of community attachment. *Forest Science*, *49*, 867-876.

Clarke, P., Ailshire, J., Melendez, R., Bader, M., & Morenoff, J. (2010). Using Google Earth to conduct a neighborhood audit: reliability of a virtual audit instrument. *Health & Place*, *16*, 1224-1229.

Clifton, K. J., Smith, A. D. L., & Rodriguez, D. (2007). The development and testing of an audit for the pedestrian environment. *Landscape and Urban Planning*, *80*, 95-110.

Comstock, N., Dickinson, L. M., Marshall, J. A., Soobader, M. J., Turbin, M. S., Buchenau, M., & Litt, J. S. (2010). Neighborhood attachment and its correlates: Exploring neighborhood conditions, collective efficacy, and gardening. *Journal of Environmental Psychology*, *30*, 435-442.

Coulton, C. J., Korbin, J., Chan, T., & Su, M. (2001). Mapping residents' perceptions of neighborhood boundaries: a methodological note. *American Journal of Community Psychology*, *29*, 371-383.

Cuba, L. & Hummon, D. M. (1993). A place to call home: Identification with dwelling, community, and region. *Sociological Quarterly*, 111-131.

Devine-Wright, P. (2013). Think global, act local? The relevance of place attachments and place identities in a climate changed world. *Global Environmental Change, 2*3, 61-69.

Devlin, K. & Nasar, J. L. (1989). The beauty and the beast: Some preliminary comparisons of 'high' versus 'popular' residential architecture and public versus architect judgments of same. *Journal of Environmental Psychology, 9,* 333-344.

Duany, A. & Plater-Zyberk, E. (1994). The neighborhood, the district and the corridor. *The New Urbanism: Toward an Architecture of Community*. New York: McGraw-Hill.

Dunlap, R. E., van Liere, K. D., & Dillman, D. A. (1979). Evidence of decline in public concern with environmental quality: A Reply. *Rural Sociology, 44,* 1.

Eisenhauer, B. W., Krannich, R. S., & Blahna, D. J. (2000). Attachments to special places on public lands: An analysis of activities, reason for attachments, and community connections. *Society & Natural Resources, 13,* 421-441.

Ellaway, A., Macintyre, S., & Bonnefoy, X. (2005). Graffiti, greenery, and obesity in adults: secondary analysis of European cross sectional survey. *British Medical Journal, 331,* 611-612.

Flaherty, J. & Brown, R. B. (2010). A Multilevel Systemic Model of Community Attachment: Assessing the Relative Importance of the Community and Individual Levels1. *American Journal of Sociology, 116,* 503-542.

Fornara, F., Bonaiuto, M., & Bonnes, M. (2010). Cross-validation of abbreviated perceived residential environment quality (PREQ) and neighborhood attachment (NA) indicators. *Environment and Behavior, 42,* 171-196.

Francis, J., Wood, L. J., Knuiman, M., & Giles-Corti, B. (May 01, 2012). Quality or quantity? Exploring the relationship between Public Open Space attributes and mental health in Perth, Western Australia. *Social Science & Medicine, 74,* 10, 1570-1577.

Fried, M. (1984). The structure and significance of community satisfaction. *Population and Environment, 7,* 61-86.

Fuentes, M., Hart-Johnson, T., & Green, C. R. (2007). The association among neighborhood socioeconomic status, race and chronic pain in black and white older adults. *Journal of the National Medical Association*, *99*, 1160.

Galster, G., Hayes, C., & Johnson, J. (2005). Identifying robust, parsimonious neighborhood indicators. *Journal of Planning Education and Research*, *24*, 265-280.

Ge, J. & Hokao, K. (2006). Research on residential lifestyles in Japanese cities from the viewpoints of residential preference, residential choice and residential satisfaction. *Landscape and Urban Planning*, *78*, 165-178.

Gerbing, D. W. & Anderson, J. C. (1985). The effects of sampling error and model characteristics on parameter estimation for maximum likelihood confirmatory factor analysis. *Multivariate Behavioral Research*, *20*, 255-271.

Giuliani, M. V. & Feldman, R. (1993). Place attachment in a developmental and cultural context. *Journal of Environmental Psychology, 13* 267-274.

Goudy, W. J. (1990). Community Attachment in a Rural Region1. *Rural Sociology*, *55*, 178-198.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (Vol. 6). Upper Saddle River, NJ: Pearson Prentice Hall.

Halpenny, E. A. (2010). Pro-environmental behaviors and park visitors: The effect of place attachment. *Journal of Environmental Psychology*, *30*, 409-421.

Hatcher, L. (2005). A step-by-step approach to using the SAS system for factor analysis and structural equation modeling. Cary, NC: SAS Institute.

Handy, S. L., Boarnet, M. G., Ewing, R., & Killingsworth, R. E. (2002). How the built environment affects physical activity: views from urban planning. *American Journal of Preventive Medicine*, *23*, 64-73.

Hays, R. A. & Kogl, A. M. (2007). Neighborhood Attachment, Social Capital Building, and Political Participation: A Case Study of Low-and Moderate-Income Residents of Waterloo, Iowa. *Journal of Urban Affairs*, *29*, 181-205.

Heckler, C. E. (1996). A Step-by-Step Approach to Using the SAS™ System for Factor Analysis and Structural Equation Modeling. *Technometrics 38*, 296-297.

Heimlich, J. E. & Ardoin, N. M. (2008). Understanding behavior to understand behavior change: A literature review. *Environmental Education Research, 14*(3), 215-237.

Hernandez, B., Hidalgo, M. C., Salazar-Laplace, M. E., & Hess, S. (2007). Place attachment and place identity in natives and non-natives. *Journal of Environmental Psychology, 27*, 310-319.

Hester, R. (1993). Sacred structures and everyday life: A return to Manteo, North Carolina. In D. Seamon (Ed.), *Dwelling, seeing, and designing* (pp. 271-297). Albany: State University of New York Press.

Hur, M., Nasar, J. L., & Chun, B. (2010). Neighborhood satisfaction, physical and perceived naturalness and openness. *Journal of Environmental Psychology*, *30*, 52-59.

Hwang, S. N., Lee, C., & Chen, H. J. (2005). The relationship among tourists' involvement, place attachment and interpretation satisfaction in Taiwan's national parks. *Tourism Management, 26*, 143-156.

Imamoglu, A. (2000). Complexity, liking and familiarity: Architecture and non-architecture Turkish students' assessments of traditional and modern house facades. *Journal of Environmental Psychology*, *20*(1), 5-16.

Jorgensen, B. S. (2010). Subjective mapping methodologies for incorporating spatial variation in research on social capital and sense of place. *Tijdschrift Voor Economische En sociale Geografie*, 101: 554-567.

Jorgensen, B. S. & Stedman, R. C. (2001). Sense of place as an attitude: Lakeshore owners attitudes toward their properties. *Journal of Environmental Psychology, 21*, 233-248.

Jorgensen, B. S. & Stedman, R. C. (2006). A comparative analysis of predictors of sense of place dimensions: Attachment to, dependence on, and identification with lakeshore properties. *Journal of Environmental Management, 79*, 316-327.

Kaltenborn, B. P. & Bjerke, T. (2002). Associations between landscape preferences and place attachment: A study in Røros, Southern Norway. *Landscape Research, 27*, 381-396.

Kaplan, S. (1987). Aesthetics, affect, and cognition environmental preference from an evolutionary perspective. *Environment and Behavior, 19*, 3-32.

Kass, R. E. & Raftery, A. E. (1995). Bayes factors. *Journal of the American Statistical Association 90*, 773-795.

Kelling, G. L. & Coles, C. M. (1996). *Fixing broken windows: Restoring order and reducing crime in our communities*. New York: Martin Kessler Books.

Kelly, C. M., Wilson, J. S., Baker, E. A., Miller, D. K., & Schootman, M. (2013). Using Google Street View to audit the built environment: inter-rater reliability results. *Annals of Behavioral Medicine, 45,* 108-112.

Kim, J. & Kaplan, R. (2004). Physical and psychological factors in sense of community new urbanist Kentlands and nearby Orchard Village. *Environment and Behavior, 36,* 313-340.

Korpela, K. M. (1989). Place-identity as a product of environmental self-regulation. *Journal of Environmental Psychology, 9,* 241-256.

Krannich, R. S. & Greider, T. (1984). Contrasting results. *Rural Sociology 49,* 541-552.

Krannich, R. S. & Greider, T. (1984). Personal well-being in rapid growth in stable communities: Multiple indicators and contrasting results. *Rural Sociology, 49,* 541-552.

Kudryavtsev, A., Stedman, R. C., & Krasny, M. E. (2012). Sense of place in environmental education. *Environmental Education Research, 18,* 229-250.

Kweon, B.-S., Sullivan, W., & Wiley, A. (1998). Green common spaces and the social integration of inner-city older adults. *Environment and Behavior, 30*, 832-858.

Kyle, G. T., Absher, J. D., & Graefe, A. R. (2003). The moderating role of place attachment on the relationship between attitudes toward fees and spending preferences. *Leisure Sciences, 25*, 33-50.

Kyle, G., Graefe, A., & Manning, R. (2005). Testing the dimensionality of place attachment in recreational settings. *Environment and Behavior*, *37*, 153-177.

LaGrange, R. L., Ferraro, K. F., & Supancic, M. (1992). Perceived risk and fear of crime: Role of social and physical incivilities. *Journal of Research in Crime and Delinquency*, *29*, 311-334.

Lahaye, M., Luminet, O., Van, B. N., Bodart, E., & Mikolajczak, M. (2010). Psychometric properties of the emotion awareness questionnaire for children in a French-speaking population. *Journal of Personality Assessment, 92*, 317-26.

Lalli, M. (1992). Urban-related identity: Theory, measurement, and empirical findings. *Journal of Environmental Psychology*, *12*, 285-303.

Leitner, M. & Brecht, H. (2007). Software review: Crime analysis and mapping with GeoDa 0.9.5-i. *Social Science Computer Review, 25,* 265-271.

Lewicka, M. (2004). ). Place attachment of Warsaw inhabitants: determinants and consequences In: J. Grzelak & T. Zarycki (Eds.). *Social map of Warsaw. Interdisciplinary study of the Warsaw Metropolis*, 273-315. Warszawa: Wydawnictwo Naukowe Scholar.

Lewicka, M. (2005). Ways to make people active: The role of place attachment, cultural capital, and neighborhood ties. *Journal of Environmental Psychology, 25*(4), 381-395.

Lewicka, M. (2008). Place attachment, place identity, and place memory: Restoring the forgotten city past. *Journal of Environmental Psychology, 28,* 209-231.

Lewicka, M. (2011). On the varieties of people's relationships with places Hummon's typology revisited. *Environment and Behavior, 43,* 676-709.

Lewicka, M. (2013). Localism and Activity as two dimensions of people–place bonding: The role of cultural capital. *Journal of Environmental Psychology, 36,* 43-53.

Long, D. A. & Perkins, D. D. (2003). Confirmatory factor analysis of the sense of community index and development of a brief SCI. *Journal of Community Psychology*, *31*, 279-296.

Low, S. M. & Altman, I. (1992). Place attachment: a conceptual inquiry. In I. Altman, & S. M. Low (Eds.), *Place attachment* (pp. 1–12). New York: Plenum Press.

Lund, H. (2002). Pedestrian environments and sense of community. *Journal of Planning education and Research*, *21*, 301-312.

MacCallum, R. C. & Austin, J. T. (2000). Applications of structural equation modeling in psychological research. *Annual Review of Psychology*, *51*, 201-226.

McMillan, D. W. & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community Psychology*, *14*, 6-23.

Marsh, H. W. & Hocevar, D. (1985). Application of confirmatory factor analysis to the study of self-concept: First-and higher order factor models and their invariance across groups. *Psychological Bulletin*, *97*, 562.

Mesch, G. S. & Manor, O. (1998). Social ties, environmental perception, and local attachment. *Environment and Behavior*, *30*, 504-519.

Millis, S. R., Malina, A. C., Bowers, D. A., & Ricker, J. H. (1999). Confirmatory factor analysis of the Wechsler Memory Scale-III. *Journal of Clinical and Experimental Neuropsychology, 21,* 87-93.

Mishra, S., Mazumdar, S., & Suar, D. (2010). Place attachment and flood preparedness. *Journal of Environmental Psychology, 30,* 187-197.

Monroe, M. C., Andrews, E., & Biedenweg, K. (2008). A framework for environmental education strategies. *Applied Environmental Education & Communication, 6,* 205-216.

Nasar, J. L. (1980). Influence of familiarity on responses to visual qualities of neighborhoods. *Perceptual and Motor Skills, 51,* 635-642

Nasar, J. L. (1994). Urban design aesthetics. The evaluative qualities of building exteriors. *Environment and Behavior, 26,* 377-401.

Nasar, J. L. (1984). Visual preferences in urban street scenes a cross-cultural comparison between Japan and the United States. *Journal of Cross-Cultural Psychology, 15,* 79-93.

Newman, S. J. & Duncan, G. J. (1979). Residential problems, dissatisfaction, and mobility. *Journal of the American Planning Association*, *45*, 154-166.

Nowell, B. L., Berkowitz, S. L., Deacon, Z., & Foster-Fishman, P. (2006). Revealing the cues within community places: stories of identity, history, and possibility. *American Journal of Community Psychology*, *37*, 29-46.

Pedersen, D. M. (1978). Relationship between environmental familiarity and environmental preference. *Perceptual and Motor Skills*, *47*, 739-743.

Perkins, D. D., Meeks, J. W., & Taylor, R. B. (1992). The physical environment of street blocks and resident perceptions of crime and disorder: Implications for theory and measurement. *Journal of Environmental Psychology*, *12*, 21-34.

Perkins, D. D., Wandersman, A., Rich, R. C., & Taylor, R. B. (1993). The physical environment of street crime: Defensible space, territoriality and incivilities. *Journal of Environmental Psychology*, *13*, 29-49.

Pikora, T. J., Bull, F. C., Jamrozik, K., Knuiman, M., Giles-Corti, B., & Donovan, R. J. (2002). Developing a reliable audit instrument to measure the physical environment for physical activity. *American Journal of Preventive Medicine*, *23*, 187-194.

Pretty, G. H., Chipuer, H. M., & Bramston, P. (2003). Sense of place amongst adolescents and adults in two rural Australian towns: The discriminating features of place attachment, sense of community and place dependence in relation to place identity. *Journal of Environmental Psychology, 23*, 273-287.

Purcell, A. T. (1992). Abstract and specific physical attributes and the experience of landscape. *Journal of Environmental Management, 34*, 159-177.

Purcell, A. T. & Nasar, J. L. (1992). Experiencing other people's houses: A model of similarities and differences in environmental experience. *Journal of Environmental Psychology, 12*, 199-211.

Putnam, R. D. (2001). Let's Play Together. Published on 03/25/2001. *The Observer* (London).

Ramkissoon, H., Smith, L. D. G., & Weiler, B. (2013). Testing the dimensionality of place attachment and its relationships with place satisfaction and pro-environmental behaviors: A structural equation modeling approach. *Tourism Management, 36*, 552-566.

Virden, R. J. & Walker, G. J. (1999). Ethnic/racial and gender variations among meanings given to, and preferences for, the natural environment. *Leisure Sciences*, *21*, 219-239.

Raymond, C. M. & Brown, G. (2011). Assessing spatial associations between perceptions of landscape value and climate change risk for use in climate change planning. *Climatic Change*, *104*, 653-678.

Raymond, C. M., Brown, G., & Weber, D. (2010). The measurement of place attachment: Personal, community, and environmental connections. *Journal of Environmental Psychology*, *30*, 422-434.

Relph, E. (1997). Sense of place. In S. Hanson (Ed.) *Ten geographic ideas that changed the world (*pp. 205-226). Rutgers, NJ: Rutgers University Press

Riger, S. & Lavrakas, P. J. (1981). Community ties: Patterns of attachment and social interaction in urban neighborhoods. *American Journal of Community Psychology*, *9*, 55-66.

Rundle, A. G., Bader, M. D., Richards, C. A., Neckerman, K. M., & Teitler, J. O. (2011). Using Google Street View to audit neighborhood environments. *Journal of Preventive Medicine*, *40*, 94-100.

Sabiston, C. M. & Crocker, P. R. (2008). Exploring self-perceptions and social influences as correlates of adolescent leisure-time physical activity. *Journal of Sport and Exercise Psychology, 30*, 3.

Sampson, R. J. (1988). Local friendship ties and community attachment in mass society: A multilevel systemic model. *American Sociological Review*, *53*, 766-779.

Scannell, L. & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology*, *30*, 1-10.

Shamai, S. & Ilatov, Z. (2005). Measuring sense of place: Methodological aspects. *Tijdschrift Voor Economische En Sociale Geografie*, *96*, 467-476.

Shklovski, I., Burke, M., Kiesler, S., & Kraut, R. (2010). Technology adoption and use in the aftermath of Hurricane Katrina in New Orleans. *American Behavioral Scientist*, *53*, 1228-1246.

Soini, K., Vaarala, H., & Pouta, E. (2012). Residents' sense of place and landscape perceptions at the rural–urban interface. *Landscape and Urban Planning, 104*, 124-134.

Spelman, W. (2004). Optimal targeting of incivility-reduction strategies. *Journal of Quantitative Criminology*, *20*, 63-88.

Stamps III, A. E. & Nasar, J. L. (1997). Design review and public preferences: effects of geographical location, public consensus, sensation seeking, and architectural styles. *Journal of Environmental Psychology, 17*, 11-32.

Stedman, R. C. (2002). Toward a social psychology of place predicting behavior from place-based cognitions, attitude, and identity. *Environment and Behavior, 34,* 561-581.

Stedman, R. C. (2003). Is it really just a social construction? The contribution of the physical environment to sense of place. *Society &Natural Resources, 16,* 671-685.

Stinner, W. F., Loon, M., Chung, S. W., & Byun, Y. (1990). Community Size, Individual Social Position, and Community Attachment1. *Rural Sociology, 55*, 494-521.

Sugihara, S. & Evans, G. W. (2000). Place attachment and social support at continuing care retirement communities. *Environment and Behavior, 32*, 400-409.

Syme, G. J., Nancarrow, B. E., & Jorgensen, B. S. (2002). The Limits of Environmental Responsibility A stormwater case study. *Environment and Behavior, 34*, 836-847.

Talen, E. (2000). Bottom-Up GIS. *Journal of the American Planning Association, 66,* 3, 279-294.

Tanaka, J. S. (1987). How big is big enough? Sample size and goodness of fit in structural equation models with latent variables. *Child Development, 58,* 134-146.

Tartaglia, S. (2006). A preliminary study for a new model of sense of community. *Journal of Community Psychology, 34,* 25-36.

Taylor, B. T., Fernando, P., Bauman, A. E., Williamson, A., Craig, J. C., & Redman, S. (2011). Measuring the quality of public open space using Google Earth. *American Journal of Preventive Medicine, 40,* 105-112.

Trentelman, C. K. (2011). Place dynamics in a mixed amenity place: Great Salt Lake, Utah. *Human Ecology Review, 18,* 126-138.

Tu Huynh, N. & Doherty, S. T. (2007). Digital sketch-map drawing as an instrument to collect data about spatial cognition. *Cartographica: The International Journal for Geographic Information and Geovisualization, 42,* 285-296.

Tversky, B. (2003). Structures of mental spaces how people think about space. *Environment and behavior, 35,* 66-80.

University Neighborhood Revitalization Plan (1996). Retrieved July 15, 2015 from http://www.columbusinfobase.org/eleclib/library/univernrp.pdf

Van den Berg, A. E., Vlek, C. A., & Coeterier, J. F. (1998). Group differences in the aesthetic evaluation of nature development plans: a multilevel approach. *Journal of Environmental Psychology, 18*, 141-157.

Vaske, J. J. & Kobrin, K. C. (2001). Place attachment and environmentally responsible behavior. *The Journal of Environmental Education, 32*, 16-21.

Waterman, S. & Gordon, D. (1984). A quantitative-comparative approach to analysis of distortion in mental maps. *The Professional Geographer, 36*, 326-337.

Weidemann, S. & Anderson, J. R. (1985). A conceptual framework for residential satisfaction. In I. Altman & C. M. Werner (Eds.) *Home environments* (pp. 153-182). New York: Springer.

Werts, C. E., Linn, R. L., & Jöreskog, K. G. (1974). Intraclass reliability estimates: Testing structural assumptions. *Educational and Psychological Measurement, 34*, 25-33.

Which ArcGIS for (2015). Retrieved July 15, 2015 from http://www.esri.com/software/arcgis/about/gis-for-me

White, D. D., Virden, R. J., & Van Riper, C. J. (2008). Effects of place identity, place dependence, and experience-use history on perceptions of recreation impacts in a natural setting. *Environmental Management*, *42*, 647-657.

Wilkinson, D. (2007). The multidimensional nature of social cohesion: Psychological sense of community, attraction, and neighboring. *American Journal of Community Psychology*, *40*, 214-229.

William, F., Ian, E., & Stephen, P. (2008). Reconciling the Architectural Preferences of Architects and the Public: The Ordered Preference Model. *Environment and Behavior, 40,* 599-618

Williams, D. R., Patterson, M. E., Roggenbuck, J. W., & Watson, A. E. (1992). Beyond the commodity metaphor: Examining emotional and symbolic attachment to place. *Leisure Sciences, 14,* 29-46.

Williams, D. R. & Vaske, J. J. (2003). The measurement of place attachment: Validity and generalizability of a psychometric approach. *Forest Science*, *49*, 830-840.

Willis, G., Lessler, J. T., & Caspar, R. A., (1999). *Cognitive interviewing: A "how to" guide*. Iowa City, Iowa: University of Iowa.

Wood, L., Frank, L. D., & Giles-Corti, B. (2010). Sense of community and its relationship with walking and neighborhood design. *Social Science & Medicine, 70*, 1381-1390.

Wynveen, C. J., Kyle, G. T., & Sutton, S. G. (2012). Natural area visitors' place meaning and place attachment ascribed to a marine setting. *Journal of Environmental Psychology*, *32*, 287-296.

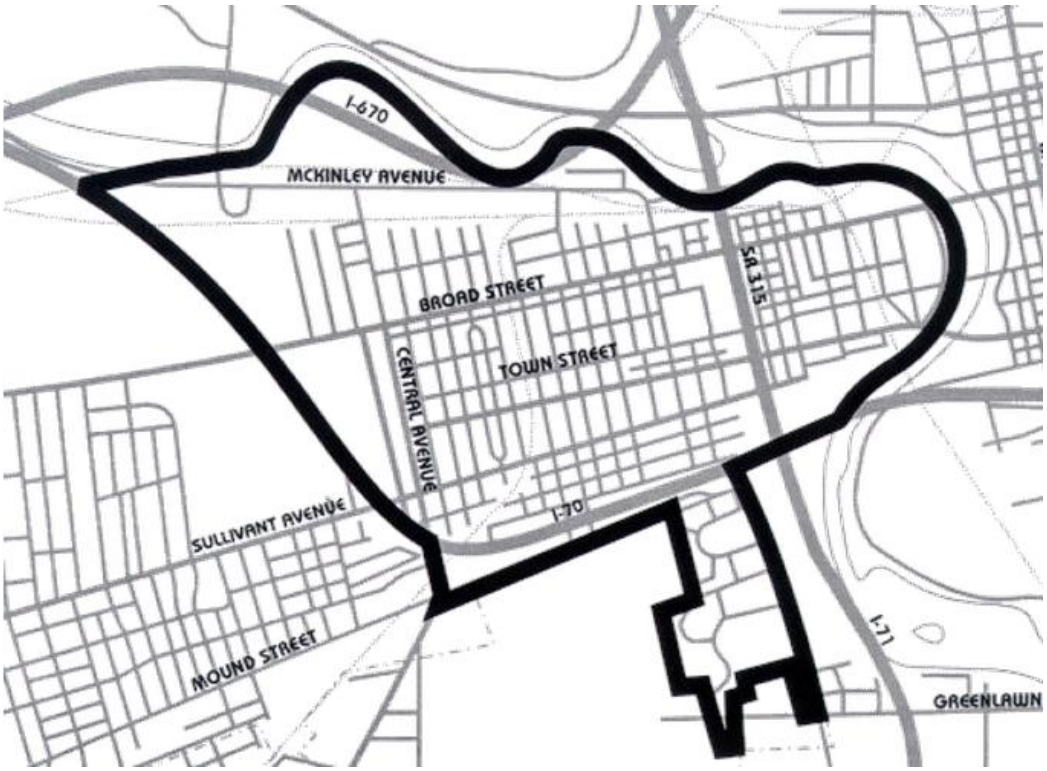
## Appendix A. Example of Questions Asked at a Commission Meeting

Below are a set of questions directed towards shaping the eventual survey questions that will be sent to the residents of Franklinton. It's a part of my dissertation on 'neighborhood attachment'. Neighborhood attachment is defined as emotional connection to neighborhood of residence. It also implies how happy and relaxed residents are at their neighborhood and how much they miss it when away.

a) On the scale of 1 to 7, 1 being not attached at all and 7 being very highly attached, what do you think is the general level of neighborhood attachment among the residents of Franklinton?

b) Please explain briefly the elements/factors that you think affect the residents' attachment to Franklinton.

c) Please verify (number), on the map, the prominent public-places/gathering-areas in Franklinton and name each one in the area below the map.


I-670
MCKINLEY AVENUE
BROAD STREET
SR 315
TOWN STREET
CENTRAL AVENUE
SULLIVANT AVENUE
I-70
MOUND STREET
I-71
GREENLAWN

1: ……

2: ……

3: ……

4: ……

5: ……

6: ……

7: ……

8: ……..

9: ……..

d) On the following map, please mark the most prominent (well known) landmarks, edges, streets, nodes and districts in Franklinton.
Below is brief definition of each of these elements:

**Paths**: the streets, sidewalks, trails, and other channels in which people travel;

**Edges**: perceived boundaries such as walls, buildings, and shorelines;

**Districts**: relatively large sections of the city distinguished by some identity or character;

**Nodes**: focal points, intersections or loci;

**Landmarks**: readily identifiable objects which serve as external reference points.

# Appendix B. Place Attachment Surveys

1) Please answer the following questions based on your level of agreement to each item.

| | Strongly-Agree | Agree | Slightly-Agree | Neutral | Slightly-Disagree | Disagree | Strongly-Disagree |
|---|---|---|---|---|---|---|---|
| 1. I feel attached to my neighborhood Strongly Agree | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 2. My neighborhood is the best area for doing the things that I enjoy most | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 3. For doing the things that I enjoy most, many other neighborhoods are better than my neighborhood | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 4. I wouldn't substitute any other neighborhood for the type of activity I do here | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 5. There are better places to be than my neighborhood | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 6. I feel like I can be really myself at my neighborhood (Jorgenson, 2006) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 7. My neighborhood says very little about who I am (Jorgenson, 2006) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 8. My neighborhood is a part of me (Kyle et al, 2004) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 9. This neighborhood means a lot to me (Kyle et al, 2004) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 10. The layout of this neighborhood is convenient (Adriaanse, 2007) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 11. This neighborhood has a pleasing ambience | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 12. I am satisfied with my living environment | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 13. Living in this neighborhood is annoying | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 14. It wouldn't really be that bad if I and the people who I appreciated in the neighborhood moved out | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 15. Being a member of this neighborhood is like being a member of a group of friends (Nasar &Julian, 2009) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 16. People here know they can get help from others in the neighborhood if they are in trouble (Nasar &Julian, 2009) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 17. This is not a close-nit neighborhood (Comstock et al, 2010) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 18. I have a lot of fond memories of past experiences with family and friends in this neighborhood (Wynveen, Kyle, Sutton, 2012) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| 19. I would be sorry if the people who I appreciated in the neighborhood moved out | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

2) Please tell us a little about yourself (by checking the one answer to each question that best describes you):

a) Your Gender: ____Male ____Female

b) Are you married? ____Yes ____No

c) Education level:

Less than high school ____

High school____

Bachelor or higher_____

d) Number of children under 18 living at home:

e) Ownership status: ____Homeowner ____Renter

f) Length of residence at the current address: < 2 years____

2-5 years____

5-10 years____

> 10 years____

g) Number of neighbors you can identify by name: < 4____

5-9____

10-14____

> 15____

h) Number of voluntarily associations you participate at your neighborhood:

i) What's the name of your neighborhood?

j) Your age: < 20 years____

20-39 years____

40-59 years____

> 60 years____

3) Please unfold the map accompanying this survey

   a) Draw your neighborhood boundary.

   b) Think of up to six special places in your neighborhood. Mark these places using numbered stickers. Briefly explain, in the space below, the reason behind your selections:

Place1:_____
_____
_____
_____

Place2:_____
_____
_____
_____

Place3:_____
_____
_____
_____

Place4:_____
_____
_____
_____

Place5:_____
_____

## Appendix C. Examples of Residents' Comments on Special Places

"Bier Stube (restaurant in University area)- Hang out with a lot of my friends there."

"My house."

"My boyfriend's apartment."

"Tuttle Park is one of the few areas around"

"King Avenue Methodist Church. I put it here because (of) proximity to this church. It was one of the reasons I decided to move to this area. I do not attend but I like the architecture, and the bells, and the banner that says all are welcome."

"Set of shops including Till, Viking Beverages,. These also seem unique to the neighborhood."

"Set of Victorian houses along Neil (avenue), especially the ones w(ith) candles in their windows at night. these give the impression of stately, comfortable, quiet I was looking for when I moved here."

"The main neighborhood boundary. The area I feel closest and most comfortable for walking around, etc."

"High Street; the main hub, everything we need can be found here: restaurants, grocery, etc."

"Indianola-the Scenic Route. If I want a long relaxing walk , either direction."

"Where I grew up."

"My immediate neighborhood and surroundings. A place to go jogging, or I often bike though to elsewhere. Do not see many people outside nor meet many people…."

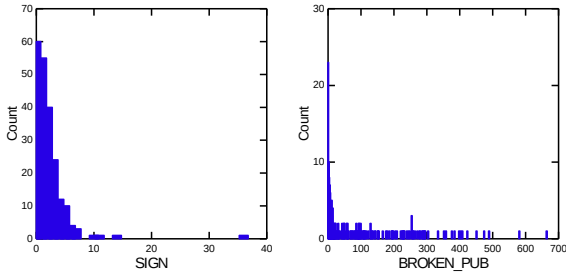
"King Avenue Methodist Church. Great place for community gatherings including piano performance, choir, etc."

"The circles in the neighborhood. Great, safe, isolated place to walk, walk pets, love kids play safely + see beautiful homes in old neighborhood surroundings."

"Bicycle path-close and great place for exercise and access to downtown and German Village."

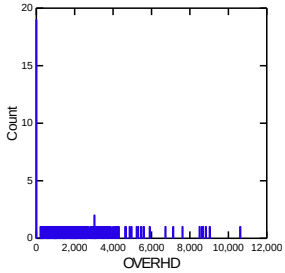
"Iuka Park; walk my dog there and play fetch, etc."

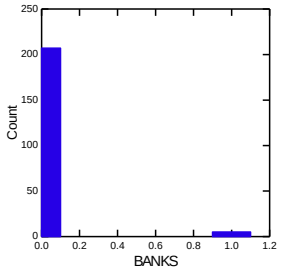
# Appendix D. Examples of Distributions of Physical Attributes

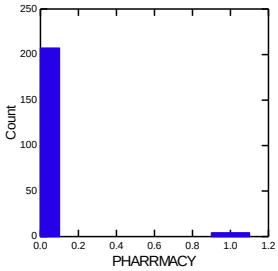


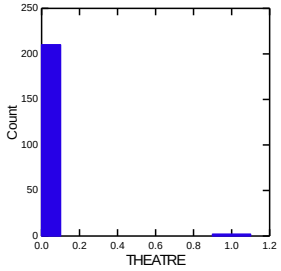






## Appendix E. List of Attributes Used in the Pen and Paper Physical Inventory Auditing

| Dilap B | Vac Lot | Pking | Graffiti | Sign | Overhd | Light | Dilap Pub | Treeln |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |

| Fence | Pitch | Porch | Single | Duplex | Multi | Other |
|---|---|---|---|---|---|---|
| | | | | | | |
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## Appendix F. Physical Variables Test of Normality and Coefficient of Variability

| | Skewness (G1) | Shapiro-Wilk Statistic | Shapiro-Wilk p-Value | Coefficient Variation |
|---|---|---|---|---|
| DILAPB | 11.93 | 0.07 | 0.00 | 7.1 |
| GRAFFITI | 1.26 | 0.92 | 0.00 | 0.7 |
| TREELN | 11.92 | 0.08 | 0.00 | 7.1 |
| ONSTPARK | 11.95 | 0.07 | 0.00 | 6.3 |
| PORCH | 11.94 | 0.07 | 0.00 | 6.1 |
| MULTI | 11.91 | 0.08 | 0.00 | 6.4 |
| STREETMAT | 11.96 | 0.06 | 0.00 | 10. |
| EAT | 0.83 | 0.95 | 0.00 | 0.64 |
| SHOP | 1.58 | 0.89 | 0.00 | 0.7 |
| OUTDIN | 0.75 | 0.94 | 0.00 | 0.7 |
| CHURCH | 0.85 | 0.94 | 0.00 | 0.5 |
| SUMSDWALK | 11.95 | 0.06 | 0.00 | 9.3 |
| SUMLAWN | 11.95 | 0.06 | 0.00 | 9.5 |
| BOUNDARYAREA | 2.69 | 0.71 | 0.00 | 1.0 |
| PARK_NUMBER | 2.25 | 0.75 | 0.00 | 1.1 |
| PARKNUMBER_BD | 11.95 | 0.06 | 0.00 | 9.8 |
| PARKAREA_BD | 11.80 | 0.10 | 0.00 | 6.5 |
| DENSITY | 11.96 | 0.06 | 0.00 | 9.8 |
| DILAPGRAFIT | 11.89 | 0.09 | 0.00 | 5.3 |
| DEST | 0.96 | 0.95 | 0.00 | 0.5 |
| WALK | 11.96 | 0.06 | 0.00 | 8.6 |
| RESIDENTIALPERC | 11.95 | 0.06 | 0.00 | 8.9 |
| COMMERCIA | 11.95 | 0.07 | 0.00 | |

Continued

Table continued

| | | | | |
|---|---|---|---|---|
| LUINDEX3 | -11.96 | 0.06 | 0.00 | -12. |
| DISTPARK | -0.09 | 0.99 | 0.349 | 0.4 |
| CLOSESTDIST | 2.45 | 0.73 | 0.00 | |
| SPECIAL | | | | 1.3 |
| SPECIAL_BD | 10.32 | 0.12 | 0.00 | 6.9 |
| CLOSEDIST_BD | 11.16 | 0.14 | 0.00 | |
| DISTPARK_BD | 11.89 | 0.08 | 0.00 | 5 |
| CONNECT_ | 11.24 | 0.12 | 0.00 | |
| SPECIAL_BD | | | | 6.3 |
| CLIPSPECIAL_ | 11.70 | 0.08 | 0.00 | |
| TOTLSPECIAL | | | | 6.9 |
| CLIPSPECIAL_BD | 11.94 | 0.07 | 0.00 | 10. |
| TOTALSPAECIAL | 4.40 | 0.47 | 0.00 | 2.1 |

## Appendix G. Means and Standard Deviation of Physical Attributes

| | Arithmetic Mean | Standard Deviation |
|---|---|---|
| DILAPB | 26.42 | 187.62 |
| GRAFFITI | 8.27 | 6.03 |
| TREELN | 8.94 | 63.80 |
| ONSTPARK | 9.35 | 59.36 |
| PORCH | 14.23 | 87.39 |
| MULTI | 25.79 | 166.70 |
| STREETMAT | 61.84 | 650.09 |
| EAT | 2.62 | 1.68 |
| SHOP | 21.74 | 16.54 |
| OUTDIN | 6.00 | 4.52 |
| CHURCH | 8.59 | 4.39 |
| SUMSDWALK | 19.08 | 178.90 |
| SUMLAWN | 11.44 | 108.97 |
| BOUNDARYAREA | 14,091,623.53 | 15,244,983.64 |
| PARK_NUMBER | 2.80 | 3.34 |
| PARKAREA_BD | 7.96 | 52.52 |
| DENSITY | 12.790 | 124.92 |
| DILAPGRAFIT | 34.69 | 187.16 |
| DEST | 6.25 | 3.52 |
| WALK | 0.055 | 0.48 |
| RESIDENTIALPERC | 2.33 | 20.83 |
| COMMERCIALPERC | 1.31 | 11.54 |
| LUINDEX3 | -12.58 | 156.84 |
| DISTPARK | 1,094.64 | 492.50 |
| CLOSESTDISTSPECIAL | 588.74 | 765.43 |
| SPECIAL_BD | 0.76 | 5.31 |
| CLOSEDIST_BD | 0.00 | 0.00 |
| DISTPARK_BD | 0.00 | 0.01 |
| CONNECT_SPECIAL_BD | 8.18 | 52.337 |
| CLIPSPECIAL_TOTLSPECIAL | 20.21 | 139.724 |
| CLIPSPECIAL_BD | 4.89 | 48.901 |
| TOTALSPAECIAL | 2,031,831.90 | 4,437,029.71 |

# Appendix H. Physical Inventory Instructions

Upkeep

- Dilapidated buildings: Determine whether there is any dilapidated building. The building is usually recognized with broken features or peeled paints.
- Graffiti: Determine whether there is any visible graffiti or tagging. Graffiti on a private waste basket visible from the street are excluded. Answer “0” if there is no graffiti; “l” if there are 1-2 small (smaller than letter-size paper) graffiti visible; “2” if there are 3-5 small or 1-2 big (up to 1-meter) graffiti or tagging; and “3” if there are more than 5 small or 1-2 over 1-meter diameter graffiti found.
- Real estate signs: Count the number of real estate signs.
- Dilapidated public features: Determine whether there is any damage on public property. Public property would include hydrants, street light fixtures, post-boxes, telephone booth, electric power poles, and information boards.
- Poles and overhead wires: Determine the ratio of each block side with poles and overhead wires. Answer “0” if there is no or little overhead wires; “1” if about half of the side is presented with overhead wires; and “2” if all or almost all the block side has overhead wires.

Walkability

- Street treeline length: Determine the ratio of each block side with treelines. Answer “0” if there is no or little treeline; “1” if about half of the side is presented with treeline; and “2” if all or almost all the block side has treeline.
- Sidewalk lawns length: Determine the ratio of each block side with lawns flanking sidewalks. Answer “0” if there is no or little lawn; “1” if about half of

the side is presented with lawn; and “2” if all or almost all the block side has lawn.

- On-street parking length: Determine the ratio of each block side with on-street parking. Answer “0” if there is no or little on-street parking; “1” if about half of the side is presented with on-street parking; and “2” if all or almost all the block side has on-street parking.
- Street material: Determine the ratio of each block side flanking brick-streets. Answer “0” if there is no or little brick street; “1” if about half of the side is flanking brick-streets; and “2” if all or almost all the block side is flanking brick-street.
- Car lines: Determine the direction of traffic flow. Answer "1" for one-way traffic; "2" for two-way traffic.
- Sidewalk length: Measure the total length of sidewalk around each block in ArcGIS
- Sidewalk condition: Determine the physical condition of sidewalks. Answer “0” for very poor condition; “1” if about half of the sidewalk is in good condition; and “2” if all or almost all the sidewalk is in good condition.
- Street width: Measure the average width of streets around each block in ArcGIS
- Sidewalk lawn width: Measure the average width of lawns flanking sidewalks around each block in ArcGIS
- Street furniture: Count the number of street benches or seats for each block
- Street median: Measure the total length of street median for streets flanking each block

Housing Style

- Pitched roof: Count the number of buildings with pitched roofs in each block
- Porches: Count the number of houses with pitched roofs in each block
- Number of floors: Determine the average floor numbers for each side of the block

- Fences: Count the number of buildings with fences in each block
- Single family: Count the number of single family housing in each block
- Duplex: Count the number of duplex housing in each block
- Multi family: Count the number of multifamily housing in each block

Destinations

- Coffee shop: Count the number of coffee shops in each block
- Grocery store: Count the number of grocery stores in each block
- Bar: Count the number of bars in each block
- Restaurant: Count the number of restaurants in each block
- Entertainment: Count the number of movie theatres and stadiums in each block
- School: Count the number of schools in each block
- Church: Count the number of churches in each block
- Outdoor dining: Count the number of coffee shops, restaurants and bars with outdoor sitting areas in each block
- Errands: Count the number of corner stores, gas stations, post offices, laundry places, and service stores in each block
- Shop: Count the number of shops in each block
- Bank: Count the number of banks in each block
- Pharmacy: Count the number of pharmacies in each block
- Theatre: Count the number of theaters in each block

Order

- Same color: Determine the ratio of each block side with same building color. Answer “0” if there is no or few buildings with same color; “1” if about half of the buildings have the same color; and “2” if all or almost all the buildings have the same color.
- Same height: Determine the ratio of each block side with same building height. Answer “0” if there is no or few buildings with same height; “1” if about half of

the buildings have the same height; and “2” if all or almost all the buildings have the same height.

## Appendix J. Tables of Predictors and Effect Sizes for GPA

| | | | Estimate | S.E. | P |
|---|---|---|---|---|---|
| Tenure | <--- | Age | 1.22 | .11 | .001 |
| Social Ties | <--- | Tenure | .27 | .06 | .001 |
| Social Bonding | <--- | Social Ties | 1.69 | .27 | .001 |
| Place Satisfaction | <--- | Closest Distance to Special Places | .00 | .00 | .001 |
| Place Satisfaction | <--- | Graffiti | -.04 | .01 | .001 |
| Place Identity | <--- | Graffiti | -.03 | .01 | .002 |
| Place Satisfaction | <--- | Social Ties | 1.16 | .21 | .001 |
| Place Identity | <--- | Social Ties | 1.62 | .25 | .001 |
| Place Dependence | <--- | Social Ties | 1.27 | .22 | .001 |
| Place Identity | <--- | Closest Distance to Special Places | .00 | .00 | .028 |
| Place Dependence | <--- | Graffiti | -.05 | .01 | .001 |
| Place Dependence | <--- | Destinations | .05 | .02 | .001 |
| Place Identity | <--- | Education | .34 | .12 | .005 |
| Place Satisfaction | <--- | Church | .04 | .01 | .010 |
| 1 | <--- | Place Identity | 1.00 | | |
| 12 | <--- | Place Identity | .99 | .08 | .001 |
| 4 | <--- | Place Identity | .67 | .10 | .001 |
| 9 | <--- | Place Identity | .59 | .09 | .001 |
| 2 | <--- | Place Dependence | 1.00 | | |
| 5 | <--- | Place Dependence | .93 | .11 | .001 |
| 7 | <--- | Place Dependence | .98 | .11 | .001 |
| 8 | <--- | Social Bonding | 1.00 | | |
| 13 | <--- | Social Bonding | .79 | .09 | .001 |
| 10 | <--- | Social Bonding | .66 | .10 | .001 |
| 3 | <--- | Place Satisfaction | 1.00 | | |

Continued

Table continued

| | | | | | |
|---|---|---|---|---|---|
| 11 | <--- | Place Satisfaction | .83 | .12 | .001 |
| Length of Residence | <--- | Tenure | 1.00 | | |
| Homeownership | <--- | Tenure | .35 | .05 | .001 |
| N.GROUPS | <--- | Social Ties | 1.00 | | |
| N.NEIGHB | <--- | Social Ties | 1.04 | .21 | .001 |

## Appendix K. Tables of Predictors and Effect Sizes for Various Models

Place identity model

| | | | Estimate | S.E. | P |
|---|---|---|---|---|---|
| NEIGHB | <--- | SOCAP | 1.27 | .28 | .001 |
| Place Identity | <--- | Social Ties | .89 | .17 | .001 |
| Place Identity | <--- | GRAFFITI | -.045 | .012 | .001 |
| Place Identity | <--- | Education | .316 | .16 | .046 |
| Place Identity | <--- | Close Distance to Special Places | .00 | .00 | .002 |
| N.NEIGHB | <--- | Social Ties | 1.00 | | |
| N.GROUIPS | <--- | Social Ties | .95 | .17 | .001 |
| Homeownership | <--- | Tenure | 1.00 | | |
| Length of Residence | <--- | Tenure | 2.21 | .43 | .001 |
| 1 | <--- | Place Identity | 1.00 | | |
| 12 | <--- | Place Identity | .95 | .09 | .001 |
| 9 | <--- | Place Identity | .59 | .09 | .001 |
| 4 | <--- | Place Identity | .64 | .10 | .001 |

Place dependence

| | | | Estimate | S.E. | P |
|---|---|---|---|---|---|
| Tenure | <--- | trln_onstpkg | .47 | .29 | .011 |
| Social Ties | <--- | Tenure | 1.06 | .26 | .001 |
| Place Dependence | <--- | Social Ties | .62 | .15 | .001 |
| Place Dependence | <--- | Children Under 18 | -.24 | .09 | .006 |
| Place Dependence | <--- | Closest Distance to Special Places | .00 | .00 | .045 |
| Place Dependence | <--- | GRAFFITI | -.05 | .01 | .001 |
| Place Dependence | <--- | Destinations | .07 | .02 | .001 |
| Place Dependence | <--- | GENDER | -.26 | .13 | .047 |
| N.NEIGHB | <--- | Social Ties | 1.16 | .22 | .001 |
| N.GROUPS | <--- | Social Ties | 1.00 | | |
| 2 | <--- | Place Dependence | 1.00 | | |
| 5 | <--- | Place Dependence | .94 | .11 | .001 |
| 7 | <--- | Place Dependence | .97 | .12 | .001 |
| Homeownership | <--- | Tenure | 1.00 | | |
| Length of Residence | <--- | Tenure | 2.29 | .50 | .001 |

Place satisfaction model

| | | | Estimate | S.E. | P |
|---|---|---|---|---|---|
| Social Ties | <--- | Tenure | 1.09 | .28 | .001 |
| Place Satisfaction | <--- | Social Ties | .33 | .13 | .015 |
| Place Satisfaction | <--- | GRAFFITI | -.05 | .01 | .001 |
| Place Satisfaction | <--- | Church | .05 | .02 | .004 |
| Place Satisfaction | <--- | Closest Distance to Special Places | .00 | .00 | .001 |
| Homeownership | <--- | Tenure | 1.00 | | |
| Length of Residence | <--- | Tenure | 2.25 | .51 | .001 |
| N.NEIGHB | <--- | Social Ties | 1.10 | .24 | .001 |
| N.GROUPS | <--- | Social Ties | 1.00 | | |
| 3 | <--- | Place Satisfaction | 1.00 | | |
| 11 | <--- | Place Satisfaction | .89 | .14 | .001 |
| 6 | <--- | Place Satisfaction | .61 | .11 | .001 |

Social bonding model

| | | | Estimate | S.E. | P |
|---|---|---|---|---|---|
| Tenure | <--- | Age | 1.23 | .11 | .001 |
| Social Ties | <--- | Tenure | .41 | .09 | .001 |
| Social Bonding | <--- | Social Ties | .83 | .14 | .001 |
| Social Bonding | <--- | Church | .03 | .01 | .070 |
| N.NEIGHB | <--- | Social Ties | 1.00 | | |
| N.GROUPS | <--- | Social Ties | .85 | .13 | .001 |
| Length of Residence | <--- | Tenure | 1.00 | | |
| Homeownership | <--- | Tenure | .34 | .05 | .001 |
| 13 | <--- | Social Bonding | 1.00 | | |
| 8 | <--- | Social Bonding | 1.19 | .15 | .001 |
| 10 | <--- | Social Bonding | .80 | .14 | .001 |